Allen-Bradley

Technical Data

PowerFlex™ 700 Adjustable Frequency AC Drives

Allen-Bradley
RELIANCE ELECTRIC
DODGE
ROCKWELL SOFTWARE
Rockwell Automation

PowerFlex™ 700 Adjustable Frequency AC Drives Technical Data

The PowerFlex 700 AC drive offers outstanding performance in an easy-to-use drive that you have come to expect from Rockwell Automation. This world-class performance comes in a small and competitively priced package. The PowerFlex 700 AC drive is designed to control three-phase induction motors in applications with requirements ranging from the simplest speed control to the most demanding torque control. Two configurations are available: standard control which includes volts per hertz and sensorless vector control; and Allen-Bradley drive's patented Force Technology™ which includes volts per hertz, sensorless vector control and Flux Vector control.

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Standard Drives Program

Flexible Packaging and Mounting

- **IP20, Type 1** — For conventional mounting inside or outside a control cabinet. Conduit plate is removable for easy installation and replacement without disturbing conduit.
- **Zero Stacking™** — Drives can be mounted next to each other with no reduction of surrounding air temperature rating (50°C). This unique bookshelf design also allows access to one drive without disturbing another.

Space Saving Hardware Features

- **Integral EMC Filtering** plus built-in common mode cores and common mode capacitors provides a compact, all-in-one package solution for meeting EMC requirements, including CE in Europe.
- **Internal Communications** allow the user to integrate the drive into the manufacturing process. Status indicators for all internal communication options are visible on the cover for easy setup and monitoring of drive communications. Users can easily manage information from shop floor to top floor and seamlessly integrate their complete system as they control, configure and collect data.
- **Integral Dynamic Brake Transistor** delivers a cost effective means of switching regenerative energy without costly external chopper circuits.
- **Internal Dynamic Brake Resistor** (up to 25 HP) requires no extra panel space, and supplies a large amount of braking torque for short periods.

Easy to Use Human Interface Tools

The PowerFlex 7-Class AC drives provide common Human Interface tools that are familiar and easy to use. These include the LCD Human Interface modules and PC-based configuration tools.

LCD Human Interface modules provide:

- Large and easy to read 7 line x 21 character backlit display
- Variety of languages (English, French, German, Italian, Spanish, Portuguese, Dutch)
- Alternate function keys for shortcuts to common tasks
- “Calculator-like” number pad for fast and easy data entry (Full Numeric version only)
- Control keys for local start, stop, speed, and direction
- Remote versions for panel mount application

PC-based Configuration tools include:

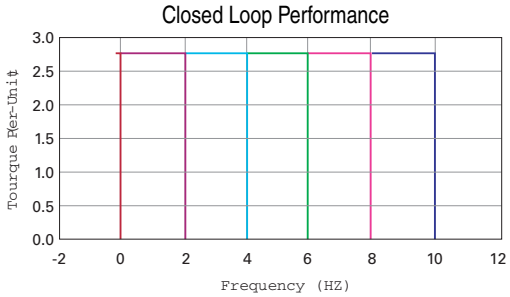
- DriveExplorer™ and DriveExplorer Lite
  - A simple and flexible “On-line” tool for monitoring and configuration while connected to a drive.
- DriveExecutive™
  - A very flexible yet friendly “On-line” and “Off-line” tool for monitoring and configuration while connected to or disconnected from a drive.

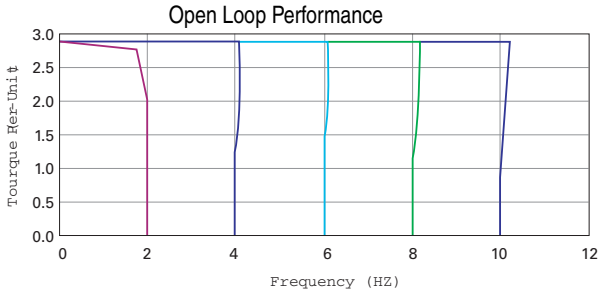
Standard Drives Program, Cont'd

Outstanding Control and Performance

Allen-Bradley drive's Flux Vector Control utilizes patented Force Technology which provides excellent low-speed performance - whether it is operated with or without feedback. While this industry-leading control provides the highest level of drive performance, it is as easy to use as any general purpose drive available. **Multiple motor control** algorithms allow performance matched to the application need:

- **Volts/Hertz** for simple Fan and Pump applications
- **Sensorless Vector** for high torque production over a wide speed range
- **Flux Vector** for outstanding torque regulation and excellent low speed / zero speed performance (with Flux Vector control cassette).





Drives Features

- Fast-acting **Current Limit** and **Bus Voltage Regulation** result in maximum acceleration and deceleration without tripping.
- **High speed analog inputs** improve drive response to torque or speed commands.
- **Programming flexibility** allows parameters to be linked within the drive.
- **Flying Start** delivers smooth connection into rotating loads, regardless of commanded direction, without the need for any speed feedback.
- **Integral Process PI Control** can eliminate the need for a separate process loop controller.
- **Intertia Ride-Through** offers tripless operation during a prolonged power outage by using the rotating energy stored in high inertia, low-friction loads.
- Speed Regulation as required:
  - **Open Loop Frequency** regulation when speed regulation is not required.
  - **Slip Compensation** delivers a minimum .5% speed regulation without feedback hardware.
  - **Droop** allows drives to load share without fighting each other.
  - **Encoder Feedback** provides up to .001% speed regulation for the tightest application requirements.

Unsurpassed Capability in Network Communications

PowerFlex drives are fully compatible with the wide variety of Allen-Bradley DPI™ communication adapters, offering the following benefits:

DeviceNet™	ControlNet™	EtherNet/IP	Remote I/O	RS-485 - DF1	Profibus	Interbus - S	Description
✔	✔	✔					**(Unconnected Messaging)** permits other network devices (e.g. PanelView™) to communicate directly to a drive without routing the communication through the network scanner.
✔	✔	✔		✔			**Adapter Routing** - Plug PC into one drive and talk to all other Allen-Bradley drives on same network, without being routed through network scanner.
✔	✔	✔	✔	✔	✔	✔	Access to 100% of all parameters over the network.
✔		✔			✔		**AutoBaud** capability makes initial connections less problematic.
✔							**Change of State** significantly reduces network traffic by configuring control messages to be sent only upon customer defined states. Very flexible configuration for each node (Example: "reference must change by more than 5%,").
✔		✔					**Peer Control** provides master-slave type control between drives, where one or more slave drives (consumers) can run based on the status of a master drive (producer), which can also significantly reduce network traffic.
✔							**ADR (Automatic Device Replacement)** saves significant time and effort when replacing a drive, by allowing the scanner to be configured to automatically detect a new drive and download the required parameter settings.
✔	✔	✔	✔	✔	✔	✔	**Flexible Fault Configuration** - Adapters can be programmed to take fault based actions as ramp to stop, coast-to-stop and hold last state, as well as send user configurable logic control and speed reference values. In addition, different actions can be taken based on whether the network experienced a serious problem (broken cable etc.) versus network idle condition (PLC set to "Program").

Catalog Number Explanation

Positions 1-8 Base Drive Selection

Base Drive				Option Selection							
Position				Position							
20B	**D**	**2P1**	**A**	**0**	**A**	**Y or N**	**N**	**A or B**	**R**	**A**	**O**
Drive	Voltage Rating	Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Code	Type
20B	700

Code	Voltage	Ph.
B	240V AC	3
C	400V AC	3
D	480V AC	3
E	600V AC	3
F	690V AC	3
J	650V DC	—
R	650V DC	—

Code	Enclosure
A	IP 20, NEMA Type 1
N	Open

Output Current @ 480V 60Hz Input

Code	Amps	HP
1P1	1.1	0.5
2P1	2.1	1.0
3P4	3.4	2.0
5P0	5	3.0
8P0	8	5.0
011	11	7.5
014	14	10
022	22	15
027	27	20
034	34	25
040	40	30
052	52	40
065	65	50
077	77	60
096	96	75
125	125	100
156	156	125
180	180	150

DC Input Voltage Classes

Drive Input Voltage	DC Precharge	Frame	Catalog Code (Position 4)
325V DC	Y	1-4	B
650V DC	Y	1-4	D
650V DC	N	5	J
650V DC	Y	5	R
650V DC	N	6	J
650V DC	Y	6	R

PowerFlex 700 Drives

208/240V AC, Three-Phase Drives

Output Amps						Nominal Power Ratings				IP20, NEMA Type 1	
240V AC Input ❶			208V AC Input			Normal Duty		Heavy Duty		Catalog Number	Frame
Cont.	1 Min.	3 Sec.	Cont.	1 Min.	3 Sec.	kW	HP	kW	HP	*20B . . .*	Size
2.2	**2.4**	**3.3**	2.5	2.8	3.8	0.37	0.5	–	0.33	B2P2A0AYNBNA0	0
4.2	**4.8**	**6.4**	4.8	5.6	7.0	0.75	1.0	0.37	0.75	B4P2A0AYNBNA0	0
6.8	**9.0**	**12**	7.8	10.4	13.8	1.5	2.0	0.75	1.5	B6P8A0AYNBNA0	1
9.6	**10.6**	**14.4**	11	12.1	17	2.2	3.0	1.5	2.0	B9P6A0AYNBNA0	1
15.3	**16.8**	**23**	17.5	19.3	26.3	4.0	5.0	2.2	3.0	B015A0AYNBNA0	1
22	**24.2**	**33**	25.3	27.8	38	5.5	7.5	4.0	5.0	B022A0AYNBNA0	1
28	**33**	**44**	32.2	38	50.6	7.5	10	5.5	7.5	B028A0AYNBNA0	2
42	**46.2**	**63**	48.3	53.1	72.5	11	15	7.5	10	B042A0AYNBNA0	3
52	**63**	**80**	56	64	86	15	20	11	15	B052A0AYNBNA0	3
70	**78**	**105**	78.2	86	117.3	18.5	25	15	20	B070A0ANNANA0	4❸
80	**105**	**136**	92	117.3	156.4	22	30	18.5	25	B080A0ANNANA0	4❸
104 (80) ❷	**115 (120)**	**175 (160)**	120 (92)	132 (138)	175 (175)	30	40	22	30	B104A0ANNANA0	5
130 (104) ❷	**143 (156)**	**175 (175)**	130 (104)	143 (156)	175 (175)	37	50	30	40	B130A0ANNANA0	5

380-480V AC, Three-Phase Drives

Output Amps						Nominal Power Ratings				IP20, NEMA Type 1	
480V AC Input ❶			380-400V AC Input			Normal Duty		Heavy Duty		Catalog Number	Frame
Cont.	1 Min.	3 Sec.	Cont.	1 Min.	3 Sec.	kW	HP	kW	HP	*20B . . .*	Size
1.1	**1.2**	**1.6**	1.3	1.4	1.9	0.37	0.5	0.25	0.33	D1P1A0AYNANA0	0
2.1	**2.4**	**3.2**	2.1	2.4	3.2	0.75	1	0.55	0.75	D2P1A0AYNANA0	0
3.4	**4.5**	**6**	3.5	4.5	6	1.5	2	0.75	1.5	D3P4A0AYNANA0	0
5	**5.5**	**7.5**	5	5.5	7.5	2.2	3	1.5	2	D5P0A0AYNANA0	0
8	**8.8**	**12**	8.7	9.9	13.2	4	5	2.2	3	D8P0A0AYNANA0	0
11	**12.1**	**16.5**	11.5	13	17.4	5.5	7.5	4	5	D011A0AYNANA0	0
14	**16.5**	**22**	15.4	17.2	23.1	7.5	10	5.5	7.5	D014A0AYNANA0	1
22	**24.2**	**33**	22	24.2	33	11	15	7.5	10	D022A0AYNANA0	1
27	**33**	**44**	30	33	45	15	20	11	15	D027A0AYNANA0	2
34	**40.5**	**54**	37	45	60	18.5	25	15	20	D034A0AYNANA0	2
40	**51**	**68**	43	56	74	22	30	18.5	25	D040A0AYNANA0	3
52	**60**	**80**	56	64	86	30	40	22	30	D052A0AYNANA0	3
65	**78**	**104**	72	84	112	37	50	30	40	D065A0AYNANA0	3
77 (65)❷	**85 (98)**	**116 (130)**	85 (72) ❸	94 (108)	128 (144)	45	60	37	50	D077A0ANNANA0	4
96 (77)❷	**106 (116)**	**144 (154)**	105 (85)	116 (128)	158 (170)	55	75	45	60	D096A0ANNANA0	5
125 (96)❷	**138 (144)**	**163 (168)**	125 (96)	138 (144)	163 (168)	75	100	55	75	D125A0ANNANA0	5
156 (125)❷	**172 (188)**	**233 (250)**	170 (140)	187 (210)	255 (280)	90	125	75	100	D156A0ANNANA0	6
180 (156)❷	**198 (234)**	**270 (312)**	205 (170) ❹	220 (255)	289 (313)	110	150	90	125	D180A0ANNANA0	6

600-690V AC, Three-Phase Drives

Output Amps						Nominal Power Ratings				IP20, NEMA Type 1	
600V AC Input ❶			690V AC Input			Normal Duty		Heavy Duty		Catalog Number	Frame
Cont.	1 Min.	3 Sec.	Cont.	1 Min.	3 Sec.	kW	HP	kW	HP	*20B . . .*	Size
22	**25.5**	**34**	–	–	–	15	20	11	15	E022A0AYNANA0	2❺
27	**33**	**44**	–	–	–	18.5	25	15	20	E027A0AYNANA0	2
32	**40.5**	**54**	–	–	–	22	30	18.5	25	E032A0AYNANA0	3❺
41	**48**	**64**	–	–	–	30	40	22	30	E041A0AYNANA0	3
52	**61.5**	**82**	–	–	–	37	50	30	40	E052A0AYNANA0	3❺

❶ Catalog number corresponds to output amps in these columns. Drive must be programmed to lower voltage to obtain higher currents shown at right.
❷ Frame 4, 5 and 6 drives have dual current ratings; one for normal duty applications, and one for heavy duty applications (in parenthesis). The drive may be operated at either rating.
❸ 380-400V, 85 A rating is limited to 45ºC surrounding air.
❹ 380-400V, 205 A rating is limited to 40ºC surrounding air.
❺ Preliminary data – check for availability before ordering.

Option Selection

Position 9 — Human Interface Modules (HIM)

Position 9 of the catalog string specifies the Human Interface Module (HIM). Four LCD styles are available as well as a blank plate. These HIMs can be factory or user installed.

20B	D	2P1	A	0	N	Y or N	N	A or B	N	N	O
Drive	Voltage Rating	Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "0" — HIM Not Used (Blank Cover Included)

Choose User Installed Kit — Leave Default Value "0"

User Installed Kit ❶

Description	Handheld/Local (Drivemount) Catalog Number
Blank Plate	20-HIM-A0
LCD Display, Digital Speed	20-HIM-A2
LCD Display, Full Numeric Keypad	20-HIM-A3
LCD Display, Analog Speed Potentiometer	20-HIM-A4
LCD Display, Programmer Only	20-HIM-A5

❶ Separately-Mounted HIMs can be found on page 11, Accessories.

Choose Catalog Code— Factory Installed Option

Factory Installed Options

Catalog Code: 0
No HIM (Blank Cover)

Catalog Code: 2
LCD Digital Speed

Catalog Code: 3
LCD Full Numeric

Catalog Code: 4
LCD Analog Speed

Catalog Code: 5
LCD Programmer Only

Position 10 — Documentation

Position 10 specifies documentation. Documentation set includes "Language" User Manual, multi-language Quick Start and a CD.

20B	D	2P1	A	0	A	Y or N	N	A or B	N	N	O
Drive	Voltage Rating	Rating	Enclosure	HIM	Documentation	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "A" — English Manual

Choose Catalog Code — Factory Installed Option

Description	Catalog Code
English Documentation Set	A
Portuguese Documentation Set	P
Spanish Documentation Set	S
No Documentation Set	N

Option Selection, Cont'd

Position 11 — Internal Brake IGBT

Position 11 specifies the Internal Dynamic Brake IGBT. It is standard on Frames 0-3.

20B	D	2P1	A	0	A	Y or N	N	A or B	N	N	O
Drive	Voltage Rating	Rating	Enclosure	HIM	Manuals	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Frames 0-3

Default Value "Y" — Internal Dynamic Brake IGBT Installed

No User Kit Available — Leave Default Value "Y"

No Catalog Code Option — Standard Installation

Factory Installed Option

Drive Input Voltage	Brake IGBT	Frame	Catalog Code
208-480V AC	Standard	0-3	Y

Frames 4-6

Default Value "N" — Dynamic Braking Not Used

No User Kit Available — Leave Default Value "N"

Choose Catalog Code — Factory Installed Option

Factory Installed Option

Drive Input Voltage	Brake IGBT	Frame	Catalog Code
208-480V AC	Optional	4	Y
208-480V AC	Optional	5	Y
208-480V AC	Optional	6	Y

Position 12 — Dynamic Brake Resistors

Position 12 specifies the Internal Dynamic Brake resistor. It is available on all drives below 100 HP. This option provides limited dynamic without increasing the drive "footprint."

Important: These resistors have a limited duty cycle. Refer to the PowerFlex Dynamic Braking Selection Guide to determine if an internal resistor will be sufficient for your application. An external resistor may be required.

20B	D	2P1	A	0	A	Y or N	N	A or B	N	N	O
Drive	Voltage Rating	Rating	Enclosure	HIM	Manuals	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "N" — No Dynamic Brake Resistor Included

Choose User Installed Kit — Leave Default Value "N"

User Installed Kit

Drive Input Voltage	Brake Resistance	Frame	Catalog Number
208-240V AC	62 Ohms	0	20BB-DB1-0
	62 Ohms	1 (2-5 Hp)	20BB-DB1-1
	22 Ohms	1 (7.5 HP)	20BB-DB2-1
	22 Ohms	2	20BB-DB1-2
380-480V AC	115 Ohms	0	20BD-DB1-0
	115 Ohms	1	20BD-DB1-1
	62 Ohms	2	20BD-DB1-2

Choose Catalog Code — Factory Installed Option

Factory Installed Option

Drive Input Voltage	Frame	Brake Resistance	Catalog Code
208-240V AC	0	62 Ohms	Y
	1 (2-5 Hp)	62 Ohms	Y
	1 (7.5 HP)	22 Ohms	Y
	2	22 Ohms	Y
380-480V AC	0	115 Ohms	Y
	1	115 Ohms	Y
	2	62 Ohms	Y

Option Selection, Cont'd

Position 13 — EMC Filter

Position 13 identifies the presence of the internal EMC filter (meets second environment CE standards) and provides the option of noise reducing common mode cores. Cores are standard on all drives below 100 HP.

Note: CE certification testing has not been performed on 600V class drives.

20B	D	2P1	A	0	A	Y or N	N	A or B	N	N	O
Drive	Voltage Rating	Rating	Enclosure	HIM	Manuals	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

380-480V AC

No User Installed Kit Available — Leave Default Value "A"

No Catalog Code Option — Standard Installation

Factory Installed Option

Drive Input Voltage	CE Filter	Frame	Common Mode Core	Catalog Code
380-480V AC	0-6	Yes	Yes	A

208-240V AC

No User Installed Kit Available — Leave Default Value "B"

No Catalog Code Option — Standard Installation

Factory Installed Option

Drive Input Voltage	CE Filter	Frame	Common Mode Core	Catalog Code
208-240V AC	Yes	3	Yes	A
208-240v AC	Yes	0-3	No	B
208-240V AC	Yes	4-6	Yes	A
380-480V AC	Yes	0-6	Yes	A

Position 14 — Communication Adapter

Position 14 selects a communications adapter for the drive. Adapters are available for most industrial networks and can be supplied factory installed or as field kits.

20B	D	2P1	A	0	A	Y or N	N	A or B	N	N	O
Drive	Voltage Rating	Rating	Enclosure	HIM	Manuals	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "N" — Communication Adapters Not Used

Choose User Installed Kit — Leave Default Value "N"

User Installed Kit

Description	Catalog Number
ControlNet Communication Adapter	20-COMM-C
DeviceNet Communication Adapter	20-COMM-D
Ethernet/IP Communication Adapter	20-COMM-E
Interbus Communication Adapter	20-COMM-I
Profibus Communication Adapter	20-COMM-P
Remote I/O Communication Adapter	20-COMM-R
RS-485 DF1 Communication Adapter	20-COMM-S
Serial Null Modem Adapter	1203-SNM
Smart Self-powered Serial Converter (RS-232) includes 1203-SFC and 1202-C10 Cables	1203-SSS

Choose Catalog Code — Factory Installed Option

Factory Installed Option

Description	Catalog Code
ControlNet	C
DeviceNet	D
Ethernet/IP	E
Remote I/O	R
RS-485 DF1	S

Option Selection, Cont'd

Position 15 — I/O Option Card

Position 15 specifies I/O voltage. For Standard Control, user kits include a separate I/O board. For Vector Control, user kits include the entire cassette, including the main control board.

20B	D	2P1	A	0	A	Y or N	N	A or B	N	N	O
Drive	Voltage Rating	Rating	Enclosure	HIM	Manuals	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Standard Cassette

Choose User Installed Kit — Leave Default Value "N"

Description	Catalog No.
24V DC/AC	20-DA1-A0
115V AC	20-DA1-B0

Choose Catalog Code — Factory Installed Option

Control	Description	Catalog Code
Standard	No I/O	N
Standard	24V DC/AC	A
Standard	115V AC	B

Vector Option

Choose User Installed Kit — Leave Default Value "N"

Control	Description	Catalog Code
Vector with 24V DC	24V DC	20B-VECT-C0
Vector with 115V AC	115V DC	20B-VECT-D0

Choose Catalog Code — Factory Installed Option

Control	Description	Catalog Code
Vector	24V DC	C
Vector	115V DC	D

Note: The Vector Control option utilizes DPI only

Position 16 — Input Cards for Feedback Devices (For Vector Control Only)

Position 16 specifies the input card for the desired feedback device. Choose between resolver or high resolution Hiperface encoder.

20B	D	2P1	A	0	A	Y or N	N	A or B	N	N	O
Drive	Voltage Rating	Rating	Enclosure	HIM	Manuals	Brake	Brake Resistor	Emission	Comm Slot	I/O	Feedback

Default Value "O" — Feedback Option Not Used

Choose User Installed Kit (Vector Control Only) — Leave Default Value "O"

Description	Catalog No.
12V Encoder	20B-ENC-1

Choose Catalog Code — Factory Installed Kit (Vector Control Only)

Factory Installed Kit	
Description	**Catalog Code**
No Encoder	0
12V Encoder	1

Accessories

Accessory kits are available to supplement the drive installation or tailor the drive to the particular requirements. These may include installation issues, communications structure or others.

Separately-Mounted Human Interface Module (HIM)

	Remote (Panel Mount) IP 66, UL Type 4x12 ❶
Description	**Catalog Number**
Blank Plate	—
LCD Display, Digital Speed	—
LCD Display, Full Numeric Keypad	20-HIM-C3 ❷
LCD Display, Analog Speed Potentiometer	—
LCD Display, Programmer Only	20-HIM-C5 ❷

❶ For indoor use only.

❷ Includes a PowerFlex HIM Interface Cable (20-HIM-H10).

Human Interface Module Interface Cables

Description	Catalog Number
Bezel Kit for LCD HIMs, NEMA 1 ❶	20-HIM-B1
PowerFlex HIM Interface Cable, 1 m (39 in.) ❷	20-HIM-H10
Cable Kit (Male-Female) ❸	
0.33 Meters (1.1 Feet)	1202-H03
1 Meter (3.3 Feet)	1202-H10
3 Meter (9.8 Feet)	1202-H30
9 Meter (29.5 Feet)	1202-H90
DPI/SCANport™ One to Two Port Splitter Cable	1203-S03

❶ Includes an interface cable (1202-C30) for connection to drive.

❷ Required only when HIM is used as handheld or remote.

❸ Required in addition to 20-HIM-H10 for distances to a total maximum of 10 Meter (32.8 Feet).)

Isolation Transformers

For installations that have specific types of AC supply configurations or require drive protection due to AC line disturbances, isolation transformers are available.

	240V, 60 Hz, Three-Phase 240V Primary & 240V Secondary	460V, 60 Hz, Three-Phase 460V Primary & 460V Secondary
Motor Rating (HP)	**IP 32(Nema Type 3R) Catalog Number**	**IP 32(Nema Type 3R) Catalog Number**
0.33	1321-3TH005-AA	1321-3TH005-BB
0.5	1321-3TH005-AA	1321-3TH005-BB
0.75	1321-3TH005-AA	1321-3TH005-BB
1	1321-3TH005-AA	1321-3TH005-BB
1.5	1321-3TH005-AA	1321-3TH005-BB
2	1321-3TH005-AA	1321-3TH005-BB
3	1321-3TH005-AA	1321-3TH005-BB
5	1321-3TH007-AA	1321-3TH007-BB
7.5	1321-3TH011-AA	1321-3TH011-BB
10	1321-3TH014-AA	1321-3TH014-BB
15	1321-3TH020-AA	1321-3TH020-BB
20	1321-3TH027-AA	1321-3TH027-BB
25		1321-3TH034-BB
30		1321-3TH040-BB
40		1321-3TH051-BB
50		1321-3TH063-BB
60		1321-3TH075-BB
75		1321-3TH093-BB
100		1321-3TH118-BB
125		1321-3TH145-BB
150		1321-3TH175-BB

Accessories, Cont'd

Line/Load Reactors

For impedance matching, protection from AC line disturbances or motor protection, reactors are available for both the input and output sides of the drive.

Input and Output Line Reactors❽ - 480V, 60 Hz, Three-Phase

			3% Impedance		5% Impedance	
	HP Rating		IP 00 (Open Style)	IP 11 (Nema Type 1)	IP 00 (Open Style)	IP 11 (NemA Type 1)
Standard Drive Catalog Number	Normal Duty	Heavy Duty	Catalog Number	Catalog Number	Catalog Number	Catalog Number
20BD1P1❹	0.5	0.33	1321-3R1-C	1321-3RA1-C	1321-3R1-B	1321-3RA1-B
20BD1P1❺	0.5	0.33	1321-3R2-B	1321-3RA2-B	1321-3R2-C	1321-3RA2-C
20BD2P1	1	0.75	1321-3R2-A	1321-3RA2-A	1321-3R2-B	1321-3RA2-B
20BD3P4❷	2	1.5	1321-3R4-B	1321-3RA4-B	1321-3R4-C	1321-3RA4-C
20BD3P4❸	2	1.5	1321-3R4-C	1321-3RA4-C	1321-3R4-D	1321-3RA4-D
20BD5P0❹	3	2	1321-3R4-B	1321-3RA4-B	1321-3R4-C	1321-3RA4-C
20BD5P0❺	3	2	1321-3R8-C	1321-3RA8-C	1321-3R8-D	1321-3RA8-D
20BD8P0❷	5	3	1321-3R8-B	1321-3RA8-B	1321-3R8-C	1321-3RA8-C
20BD8P0❸	5	3	1321-3R4-B	1321-3RA4-B	1321-3R4-C	1321-3RA4-C
20BD011❷	7.5	5	1321-3R12-B	1321-3RA12-B	1321-3R12-C	1321-3RA12-C
20BD011❸	7.5	5	1321-3R8-B	1321-3RA8-B	1321-3R8-C	1321-3RA8-C
20BD014❷	10	7.5	1321-3R18-B	1321-3RA18-B	1321-3R18-C	1321-3RA18-C
20BD014❸	10	7.5	1321-3R12-B	1321-3RA12-B	1321-3R12-C	1321-3RA12-C
20BD022❷	15	10	1321-3R25-B	1321-3RA25-B	1321-3R25-C	1321-3RA25-C
20BD022❸	15	10	1321-3R18-B	1321-3RA18-B	1321-3R18-C	1321-3RA18-C
20BD027❷	20	15	1321-3R35-B	1321-3RA35-B	1321-3R35-C	1321-3RA35-C
20BD027❸	20	15	1321-3R25-B	1321-3RA25-B	1321-3R25-C	1321-3RA25-C
20BD034	25	20	1321-3R35-B	1321-3RA35-B	1321-3R35-C	1321-3RA35-C
20BD040❸	30	25	1321-3R35-B	1321-3RA35-B	1321-3R35-C	1321-3RA35-C
20BD040❺	30	25	1321-3R45-B	1321-3RA45-B	1321-3R45-C	1321-3RA45-C
20BD052❸	40	30	1321-3R45-B	1321-3RA45-B	1321-3R45-C	1321-3RA45-C
20BD052❺	40	30	1321-3R55-B	1321-3RA55-B	1321-3R55-C	1321-3RA55-C
20BD065❸	50	40	1321-3R55-B	1321-3RA55-B	1321-3R55-C	1321-3RA55-C
20BD065❷	50	40	1321-3R80-B	1321-3RA80-B	1321-3R80-C	1321-3RA80-C
20BD096❻	75	60	1321-3R80-B	1321-3RA80-B	1321-3R80-C	1321-3RA80-C
20BD096❼	75	60	1321-3R100-B	1321-3RA100-B	1321-3R100-C	1321-3RA100-C
20BD125❻	100	75	1321-3R100-B	1321-3RA100-B	1321-3R100-C	1321-3RA100-C
20BD156	100		1321-3R130-B	1321-3RA130-B	1321-3R130-C	1321-3RA130-C
20BD156		125	1321-3R160-B	1321-3RA160-B	1321-3R160-C	1321-3RA160-C
20BD180	125		1321-3R160-B	1321-3RA160-B	1321-3R160-C	1321-3RA160-C
20BD180		150	1321-3R200-B	1321-3RA200-B	1321-3R200-C	1321-3RA200-C

❶ Note the discount schedule difference between 1321 and PowerFlex 700 products.
❷ Normal Duty Input/Output and Heavy Duty Output
❸ Heavy Duty Input
❹ Normal Duty/Heavy Duty Input
❺ Normal Duty/Heavy Duty Output
❻ Heavy Duty Input/Output
❼ Normal Duty Input/Output
❽ Input line reactors were sized based on the NEC fundamental motor amps.
Output line reactors were sized based on the VFD rated output currents.

Accessories, Cont'd

Reflected Wave Reduction

Reflected Wave Reduction Device with Common Mode Choke

Description	Used with	Catalog Number (Loose Kit)
380-600V AC, 17.5A IP20 (NEMA Type1)	3.7-7.5 KW (5-10HP)	1204-RWC-17-A

Reflected Wave Reduction Device

Description	Used with	Catalog Number (Loose Kit)
380-575V AC, 9A IP 20 (NEMA Type1)	0.37-3.7 kW (0.5-5HP) 380-460V & 500-600V A Frame Devices	1204-RWR2-09-B

Terminator

Description ❶	Used with	Catalog Number (Loose Kit)
IP65 (NEMA Type4x) Connection Cable Included	0.37-1.5 kW (0.5-2HP) 460V Drives 0.75-597 kW (1-800 HP) 575V Drives	1204-TFA1
	1.5-597 kW (2-800 HP) 460V Drives 0.75-597 kW (1-800 HP) 575 Drives	1204-TFB2

❶ Correct terminator selection is dependent on motor characteristics, cable type and cable length. Refer to publication 1204-1.0 for application details before ordering.

PowerFlex™ 700 Configured Drives

Bulletin Numbers 21B and 21X

25 Horsepower PowerFlex 700

- NEMA Type 1
- 480V
- Fused Disconnect
- LCD Full Numeric Panel Mount Human Interface Module (HIM)
- Control Power
- DeviceNet
- Input and Output Line Reactors
- Bypass
- Drive Fault and Pilot Light

Product Description

Configured PowerFlex 700 AC drives are ideal for global Original Equipment Manufacturers (OEM) and end users with special installation needs. This program simplifies installation and start-up by allowing users to order drive packages that combine operator interface, control, communications and power options in pre-configured assemblies. Designed to meet customer demands for space savings, application flexibility and reliability, Configured PowerFlex 700 AC drives offer a number of commonly requested pre-engineered options, as well as more complex custom-engineered packages.

Benefits

- Simplified installation and start-up by use of common options assembled at the factory.
- Drive functionality exceeds options offered with a standard drive.
- Multiple packaging options specific to customer needs.
- Pre-engineered options for easy order entry, consistent manufacturing, high quality and reduced deliveries.
- Selectable configurations to meet application requirements.

Features

- Standard PowerFlex 700 AC drives and drive-related options.
- Six pulse and multi-pulse.
- Enclosure options: Type 1, Type 12 (fan and filter or convection/AC), and Type 4 (indoor).
- Pre-engineered options.
- Custom/engineered solutions.
- UL panel recognition from the factory for pre-engineered options.

Options

- Drive Input Protection
- Input/Output Contactors
- Input/Output Line Reactors
- Bypass
- Control Power
- Control Interface and Feedback
- Communication
- Human Interface Module (HIM)
- Motor Interface
- Door Mounted Operator Devices

Please contact your local distributor or sales office for product availability.

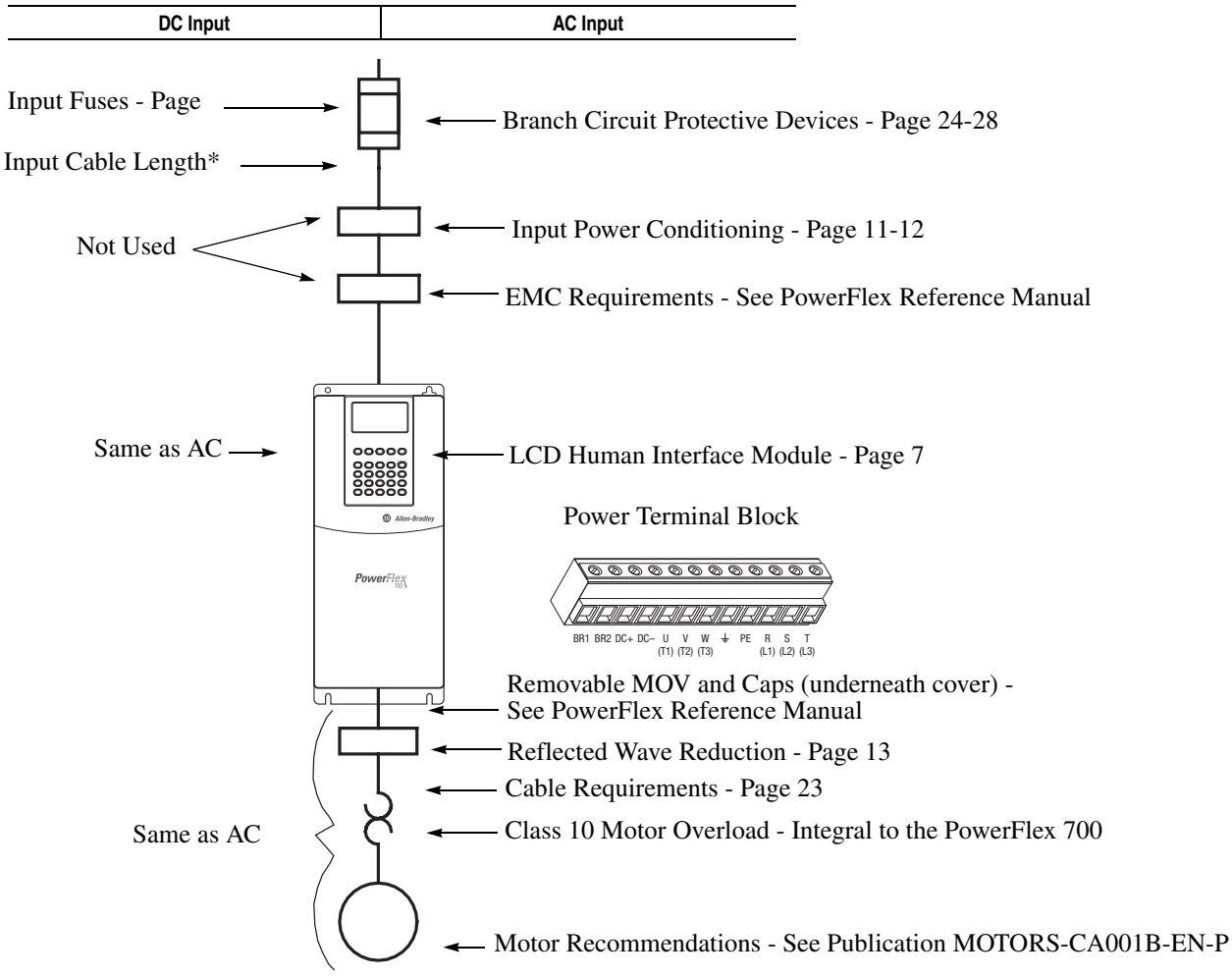
Power Wiring

The PowerFlex 700 has the following built in protective features to help simplify installation:

- Ground fault protection during start up and running ensures reliable operation
- Electronic motor overload protection increases motor life
- Removable MOV to ground and common mode capacitors to ground ensure compatibility with ungrounded systems
- 6 kV transient protection provides increased robustness for 380-480V system voltages

There are many other factors that must be considered for optimal performance in any given application. The block diagram below highlights the primary installation considerations. Consult the *PowerFlex Reference Manual* available online at **www.ab.com/manuals/dr,** for detailed recommendations on input power conditioning, CE conformance (EMC filtering), dynamic braking, reflected wave protection, motor cable types and motor cable distances.

The block diagram below also provides direction on other installation issues and concerns.


DC Input
AC Input
Input Fuses - Page
Branch Circuit Protective Devices - Page 24-28
Input Cable Length*
Not Used
Input Power Conditioning - Page 11-12
EMC Requirements - See PowerFlex Reference Manual
Same as AC
LCD Human Interface Module - Page 7
Power Terminal Block
BR1 BR2 DC+ DC– U (T1) V (T2) W (T3) ⏚ PE R (L1) S (L2) T (L3)
Removable MOV and Caps (underneath cover) - See PowerFlex Reference Manual
Reflected Wave Reduction - Page 13
Cable Requirements - Page 23
Same as AC
Class 10 Motor Overload - Integral to the PowerFlex 700
Motor Recommendations - See Publication MOTORS-CA001B-EN-P

* Input Cable Length is limited. See Publication 20B-UM001x-EN-P for further details.

Terminals

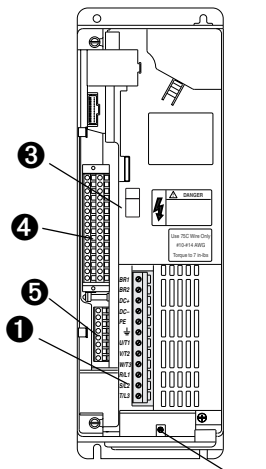
Terminal Block Specifications

No.	Name	Frame	Description	Wire Size Range (1)		Torque	
				Maximum	Minimum	Maximum	Recommended
❶	Power Terminal Block	0 & 1	All power terminals	4.0 mm² (10 AWG)	0.5 mm² (22 AWG)	1.7 N-m (15 lb.-in.)	0.8 N-m (7 lb.-in.)
		2	All power terminals	10.0 mm² (6 AWG)	0.8 mm² (18 AWG)	1.7 N-m (15 lb.-in.)	1.4 N-m (12 lb.-in.)
		3	All power terminals	25.0 mm² (3 AWG)	2.5 mm² (14 AWG)	3.6 N-m (32 lb.-in.)	1.8 N-m (16 lb.-in.)
			All power terminals	10.0 mm² (6 AWG)	0.8 mm² (18 AWG)	1.7 N-m (15 lb.-in.)	1.4 N-m (12 lb.-in.)
		4	All power terminals	35.0 mm² (1/0 AWG)	10 mm² (8 AWG)	2.9 N-m (24 lb.-in.)	2.9 N-m (24 lb.-in.)
		5 (75 HP) (2)	PS-, PS+	35.0 mm² (1/0 AWG)	2.5 mm² (14 AWG)	3.6 N-m (32 lb.-in.)	3.6 N-m (32 lb.-in.)
			PE	35.0 mm² (1/0 AWG)	16.0 mm² (6 AWG)	5 N-m (44 lb.-in.)	5 N-m (44 lb.-in.)
		5 (100 HP) (2)	PS-, PS+	70.0 mm² (3/0 AWG)	16.0 mm² (4 AWG)	15 N-m (133 lb.-in.)	15 N-m (133 lb.-in.)
			BR1, 2, terminals	35.0 mm² (1/0 AWG)	2.5 mm² (14 AWG)	3.6 N-m (32 lb.-in.)	3.6 N-m (32 lb.-in.)
			PE	35.0 mm² (1/0 AWG)	16.0 mm² (6 AWG)	5 N-m (44 lb.-in.)	5 N-m (44 lb.-in.)
		6	DC+, DC–, BR1, BR2, PE and motor connections	70.0 mm² (250 MCM)	2.5 mm² (14 AWG)	6 N-m (52 lb.-in.)	6 N-m (52 lb.-in.)
❷	SHLD Terminal	0-6	Terminating point for wiring shields	—	—	1.6 N-m (14 lb.-in.)	1.6 N-m (14 lb.-in.)
❸	AUX Terminal Block	0-4	Auxiliary Control Voltage (3)	1.3 mm² (16 AWG)	0.2 mm² (24 AWG)	—	—
		5-6		4.0 mm² (10 AWG)	0.5 mm² (22 AWG)	0.6 N-m (5.3 lb.-in.)	0.6 N-m (5.3 lb.-in.)
❹	I/O Terminal Block	5-6	Signal and control connections	2.1 mm² (14 AWG)	0.30 mm² (22 AWG)	1.36 N-m (12 lb.-in.)	1.36 N-m (12 lb.-in.)
❺	Encoder Terminal Block (4)	5-6	Encoder power and signal connections	0.75 mm² (18 AWG)	0.196 mm² (24 AWG)	1.36 N-m (12 lb.-in.)	1.36 N-m (12 lb.-in.)
❻	Fan Terminal Block	5-6	User Supplied Fan Voltage	4.0 mm² (10 AWG)	0.5 mm² (22 AWG)	0.6 N-m (5.3 lb.-in.)	0.6 N-m (5.3 lb.-in.)

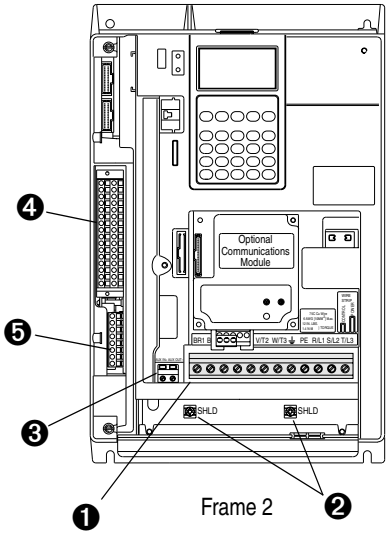
Notes:

(1) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.
(2) Not all terminals present on all drives.
(3) External control power:
UL Installation - 300V DC, ±10%, Non UL Installation - 270-600V DC, ±10%.
0-3 Frame - 40 W, 165 mA, 5 Frame - 80 W, 90 mA
(4) Maximum/minimum sizes that the terminal block will accept - these are not recommendations.

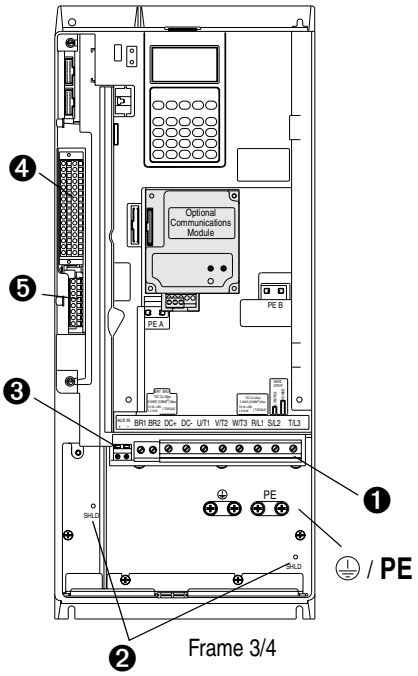
Terminals, Cont'd



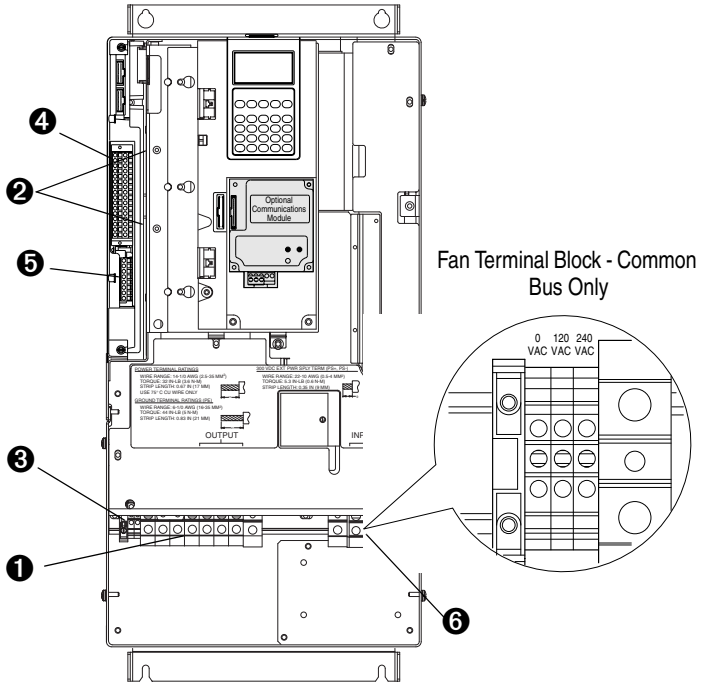
Frame 0/1



Frame 2

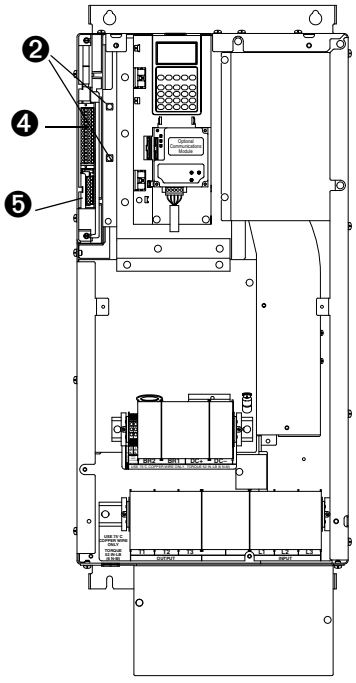


Frame 3/4



Frame 5

Fan Terminal Block - Common Bus Only

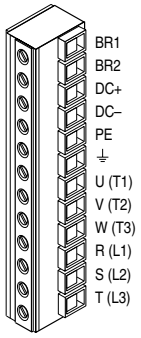


Frame 6

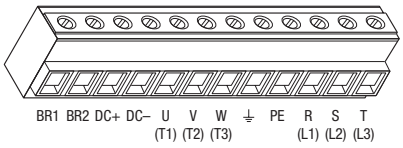
Fan VA Rating - Common Bus Only

Frame	Rating *(at any voltage)*
5	100 VA
6	138 VA

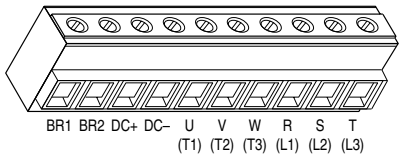
Terminals, Cont'd



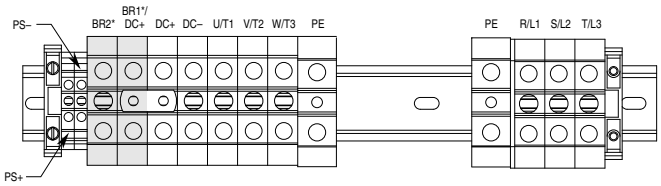
Frames 0 & 1



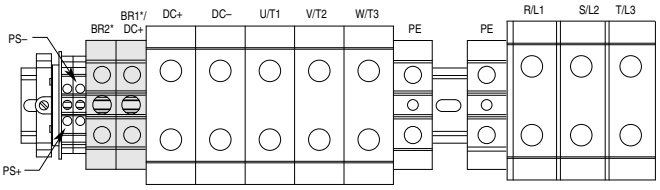
Frame 2



Frame 3 & 4

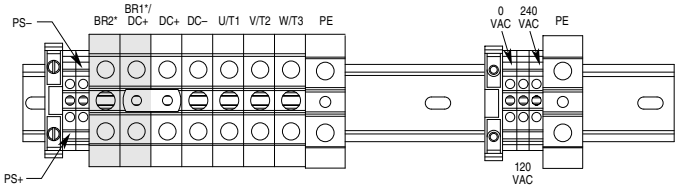


Frame 5 – 75 HP, 480V (55kW, 400V) Normal Duty Drive



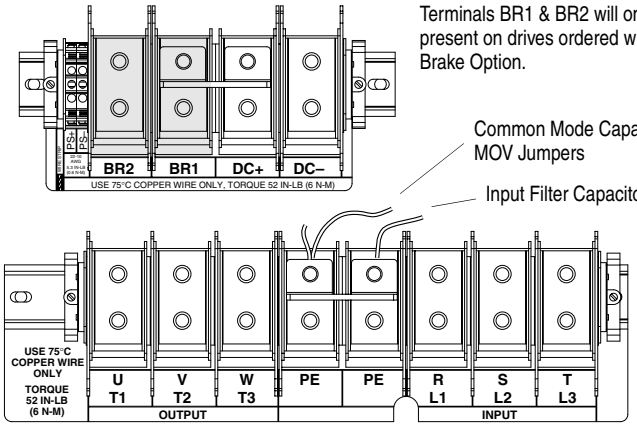
Frame 5 – 100 HP, 480V Normal Duty Drive

***** Terminals BR1 & BR2 will only be present on drives ordered with the Brake Option.



Frame 5 - Common Bus

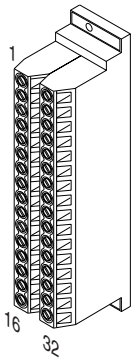
Terminal	Description	Notes
BR1	DC Brake (+)	Dynamic Brake Resistor Connection (+)
BR2	DC Brake (–)	Dynamic Brake Resistor Connection (–)
DC+	DC Bus (+)	DC Input Power or Dynamic Brake Chopper
DC–	DC Bus (–)	DC Input Power or Dynamic Brake Chopper
PE	PE Ground	Refer to page 17 for location on 3 Frame drives
⏚	Motor Ground	Refer to page 17 for location on 3 Frame drives
U	U (T1)	To motor
V	V (T2)	To motor
W	W (T3)	To motor
R	R (L1)	AC Line Input Power
S	S (L2)	AC Line Input Power
T	T (L3)	AC Line Input Power



Terminals BR1 & BR2 will only be present on drives ordered with the Brake Option.

Frame 6

Control Terminals

Standard Control Option	No.	Signal	Factory Default	Description	Related Param.
	1	Anlg Volts In 1 (–)	(2)	Isolated (3), bipolar, differential, ±10V, 11 bit & sign, 88k ohm input impedance.	320 - 327
	2	Anlg Volts In 1 (+)			
	3	Anlg Volts In 2 (–)	*(2)*	Isolated (4), bipolar, differential, ±10V, 11 bit & sign, 88k ohm input impedance.	
	4	Anlg Volts In 2 (+)			
	5	Pot Common	–	For (+) and (–) 10V pot references.	
	6	Anlg Volts Out 1 (–)	*(2)*	Bipolar, ±10V, 11 bit & sign, 2k ohm minimum load.	340 - 344
	7	Anlg Volts Out 1 (+)			
	8	Anlg Current Out 1 (–)	*(2)*	4-20mA, 11 bit & sign, 400 ohm maximum load.	
	9	Anlg Current Out 1 (+)			
	10	Reserved for Future Use			
	11	Digital Out 1 – N.C. (1)	Fault	Max. Resistive Load: 240V AC/30V DC – 1200VA, 150W Max. Current: 5A, Min. Load: 10mA Max. Inductive Load: 240V AC/30V DC – 840VA, 105W Max. Current: 3.5A, Min. Load: 10mA	380 - 387
	12	Digital Out 1 Common			
	13	Digital Out 1 – N.O. *(1)*	NOT Fault		
	14	Digital Out 2 – N.C. *(1)*	NOT Run		
	15	Digital Out 2 Common			
	16	Digital Out 2 – N.O. *(1)*	Run		
	17	Anlg Current In 1 (–)	*(2)*	Isolated *(3)*, 4-20mA, 11 bit & sign, 124 ohm input impedance.	320 - 327
	18	Anlg Current In 1 (+)			
	19	Anlg Current In 2 (–)	*(2)*	Isolated *(4)*, 4-20mA, 11 bit & sign, 124 ohm input impedance.	
	20	Anlg Current In 2 (+)			
	21	–10V Pot Reference	–	2k ohm minimum.	
	22	+10V Pot Reference	–		
	23	Reserved for Future Use			
	24	+24VDC *(5)*	–	Drive supplied logic input power. (5)	
	25	Digital In Common	–		
	26	24V Common *(5)*	–	Drive supplied logic input power. *(5)*	
	27	Digital In 1	Stop - CF	115V AC, 50/60 Hz - Opto isolated Low State: less than 30V AC High State: greater than 100V AC 24V AC/DC, 50/60 Hz - Opto isolated Low State: less than 5V AC/DC High State: greater than 20V AC/DC 11.2 mA DC	361 - 366
	28	Digital In 2	Start		
	29	Digital In 3	Jog		
	30	Digital In 4	Speed Sel 1		
	31	Digital In 5	Speed Sel 2		
	32	Digital In 6	Speed Sel 3		

Notes:

(1) Contacts in unpowered state. Any relay programmed as Fault or Alarm will energize (pick up) when power is applied to drive and deenergize (drop out) when a fault or alarm exists. Relays selected for other functions will energize only when that condition exists and will deenergize when condition is removed.

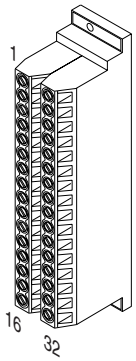
(2) These inputs/outputs are dependant on a number of parameters. See “Related Parameters.”

(3) Differential Isolation - External source must be maintained at less than 160V with respect to PE. Input provides high common mode immunity.

(4) Differential Isolation - External source must be less than 10V with respect to PE.

(5) 150mA maximum Load. Not present on 115V versions.

Control Terminals, Cont'd

Vector Control Option	No.	Signal	Factory Default	Description	Related Param.
	1	Analog In 1 (–) (1)	(2)	Isolated (3), bipolar, differential, ±10V/4-20mA, 11 bit & sign, 88k ohm input impedance. For 4-20mA, a jumper must be installed at terminals 17 & 18 (or 19 & 20).	320 - 327
	2	Analog In 1 (+) *(1)*			
	3	Analog In 2 (–) *(1)*			
	4	Analog In 2 (+) *(1)*			
	5	Pot Common	–	For (+) and (–) 10V pot references.	
	6	Analog Out 1 (–)	*(2)*	Bipolar (current output is not bipolar), ±10V/4-20mA, 11 bit & sign, voltage mode - limit current to 5 mA. Current mode - max. load resistance is 400 ohms.	340 - 347
	7	Analog Out 1 (+)			
	8	Analog Out 2 (–)			
	9	Analog Out 2 (+)			
	10	Reserved for Future Use			
	11	Digital Out 1 – N.C. (4)	Fault	Max. Resistive Load: 240V AC/30V DC – 1200VA, 150W Max. Current: 5A, Min. Load: 10mA Max. Inductive Load: 240V AC/30V DC – 840VA, 105W Max. Current: 3.5A, Min. Load: 10mA	380 - 391
	12	Digital Out 1 Common			
	13	Digital Out 1 – N.O. *(4)*	NOT Fault		
	14	Digital Out 2 – N.C. *(4)*	NOT Run		
	15	Digital Out 2/3 Com.			
	16	Digital Out 3 – N.O. *(4)*	Run		
	17	Current In Jumper *(1)* – Analog In 1		Placing a jumper across terminals 17 & 18 (or 19 & 20) will configure that analog input for current.	
	18				
	19	Current In Jumper *(1)* – Analog In 2			
	20				
	21	–10V Pot Reference	–	2k ohm minimum load.	
	22	+10V Pot Reference	–		
	23	Reserved for Future Use			
	24	+24V DC *(5)*	–	Drive supplied logic input power. (5)	
	25	Digital In Common	–		
	26	24V Common *(5)*	–	Same as terminal 24.	
	27	Digital In 1	Stop - CF	115V AC, 50/60 Hz - Opto isolated Low State: less than 30V AC High State: greater than 100V AC 24V DC - Opto isolated Low State: less than 5V DC High State: greater than 20V DC 11.2 mA DC	361 - 366
	28	Digital In 2	Start		
	29	Digital In 3	Jog		
	30	Digital In 4	Speed Sel 1		
	31	Digital In 5	Speed Sel 2		
	32	Digital In 6/Hardware Enable	Speed Sel 3		

Notes:

(1) **Important:** 4-20mA operation requires a jumper at terminals 17 & 18 (or 19 & 20). Drive damage may occur if jumper is not installed.

(2) These inputs/outputs are dependant on a number of parameters (see "Related Parameters").

(3) Differential Isolation - External source must be maintained at less than 160V with respect to PE. Input provides high common mode immunity.

(4) Contacts in unpowered state. Any relay programmed as Fault or Alarm will energize (pick up) when power is applied to drive and deenergize (drop out) when a fault or alarm exists. Relays selected for other functions will energize only when that condition exists and will deenergize when condition is removed.

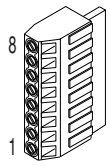
(5) 150mA maximum Load. Not present on 115V versions.

Control Terminals Cont'd

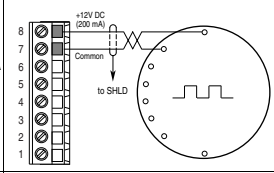
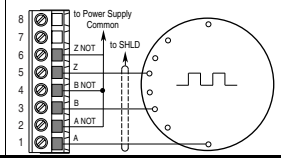
Encoder Terminal Block (Vector Control Option Only)

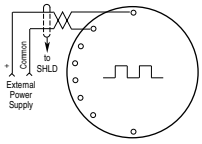
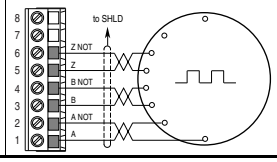
Table 0.A Encoder Terminal Designations

	No.	Description (refer to page 37 for encoder specifications)	
See "Detail" on page 18	8	+12V DC Power	Internal power source 250 mA.
	7	+12V DC Return (Common)	
	6	Encoder Z (NOT)	Pulse, marker or registration input.
	5	Encoder Z	
	4	Encoder B (NOT)	Quadrature B input.
	3	Encoder B	
	2	Encoder A (NOT)	Single channel or quadrature A input.
	1	Encoder A	

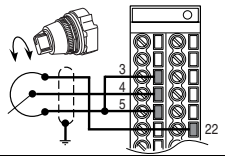
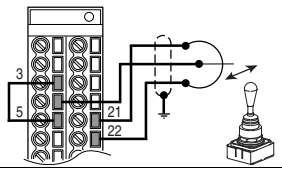
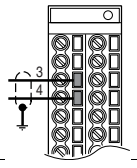
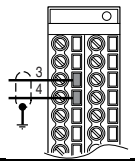


Sample Encoder Wiring

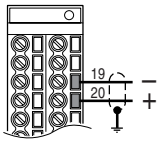
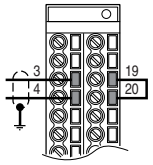
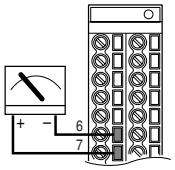
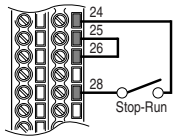
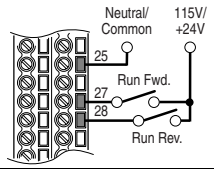
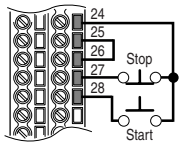
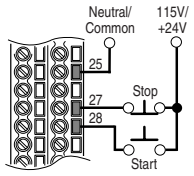
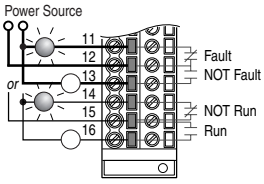
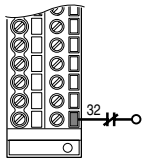
I/O	Connection Example
Encoder Power –Internal Drive Power Internal (drive) 12V DC, 250mA	
Encoder Signal –Single-Ended, Dual Channel	

I/O	Connection Example
Encoder Power –External Power Source	
Encoder Signal – Differential, Dual Channel	

I/O Wiring Examples – Standard & Vector Control Options

Input/Output	Connection Example	Required Parameter Changes
Potentiometer Unipolar Speed Reference (1) 10k Ohm Pot. Recommended (2k Ohm Minimum)		[2] Adjust Scaling: Parameters 91/92 and 325/326 [2] View Results: Parameter 002
Joystick Bipolar Speed Reference *(1)* ±10V Input		[2] Set Direction Mode: Parameter 190 = "1, Bipolar" [2] Adjust Scaling: Parameters 91/92 and 325/326 [2] View Results: Parameter 002
Analog Input Bipolar Speed Reference ±10V Input		[2] Set Direction Mode: Parameter 190 = "1, Bipolar" [2] Adjust Scaling: Parameters 91/92 and 325/326 [2] View Results: Parameter 002
Analog Voltage Input Unipolar Speed Reference 0 to +10V Input		[2] Configure Input with parameter 320 [2] Adjust Scaling: Parameters 91/92 and 325/326 [2] View results: Parameter 002

Installation Considerations

Input/Output	Connection Example	Required Parameter Changes
Analog Current Input Unipolar Speed Reference **Standard** 4-20 mA Input		[2] Configure Input for Current: Parameter 320, Bit 1 = "1, Current" [2] Adjust Scaling: Parameters 91/92 and 325/326 [2] View Results: Parameter 002
Analog Current Input Unipolar Speed Reference **Vector** 4-20 mA Input		[2] Configure Input for Current: Parameter 320 and add jumper at appropriate terminals [2] Adjust Scaling: Parameters 91/92 and 325/326 [2] View results: Parameter 002
Analog Output ±10V, 4-20 mA Bipolar +10V Unipolar *(shown)* Standard Control 4-20 mA Unipolar *(use term. 8 & 9)*		[2] Configure with Parameter 340 [2] Select Source Value: Parameter 384, [Digital Out1 Sel] [2] Adjust Scaling: Parameters 343/344
2-Wire Control Non-Reversing (2) 24V DC internal supply		[2] Disable Digital Input:#1: Parameter 361 = "0, Unused" [2] Set Digital Input #2: Parameter 362 = "7, Run" [2] Set Direction Mode: Parameter 190 = "0, Unipolar"
2-Wire Control Reversing *(2)* External supply (I/O Board dependent)		[2] Set Digital Input:#1: Parameter 361 = "8, Run Forward" [2] Set Digital Input #2: Parameter 362 = "9, Run Reverse"
3-Wire Control Internal supply		[2] No Changes Required
3-Wire Control External supply (I/O Board dependent). Requires 3-wire functions only ([Digital In1 Sel]). Using 2-wire selections will cause a type 2 alarm.		[2] No Changes Required
Digital Output Relays shown in powered state with drive faulted. See pages 18 & 19. Standard Control 1 relay at terminals 14-16. Vector Control 2 relays at terminals 14-16.		[2] Select Source to Activate: Parameters 380/384
Enable Input		[2] Standard Control Configure with parameter 366 [2] Vector Control Configure with parameter 366 For dedicated hardware Enable: Remove Jumper J10 (see page 18)

Notes:

(1) Refer to *PowerFlex 700 User Manual* for more information on bipolar wiring.

(2) **Important:** Programming inputs for 2 wire control deactivates all HIM Start buttons.

[2]

Cable Recommendations

Cable Types Acceptable for 200-600 Volt Installations

A variety of cable types are acceptable for drive installations. For many installations, unshielded cable is adequate, provided it can be separated from sensitive circuits. As an approximate guide, allow a spacing of 0.3 meters (1 foot) for every 10 meters (32.8 feet) of length. In all cases, long parallel runs must be avoided. Do not use cable with an insulation thickness less than or equal to 15 mils (0.4 mm/0.015 in.). See table below.

Unshielded

THHN, THWN or similar wire is acceptable for drive installation in dry environments provided adequate free air space and/or conduit fill rates limits are provided. **Do not use THHN or similarly coated wire in wet areas**. Any wire chosen must have a minimum insulation thickness of 15 Mils and should not have large variations in insulation concentricity.

Shielded/Armored Cable

Shielded cable contains all of the general benefits of multi-conductor cable with the added benefit of a copper braided shield that can contain much of the noise generated by a typical AC drive. Strong consideration for shielded cable should be given in installations with sensitive equipment such as weigh scales, capacitive proximity switches and other devices that may be affected by electrical noise in the distribution system. Applications with large numbers of drives in a similar location, imposed EMC regulations or a high degree of communications/ networking are also good candidates for shielded cable.

Shielded cable may also help reduce shaft voltage and induced bearing currents for some applications. In addition, the increased impedance of shielded cable may help extend the distance that the motor can be located from the drive without the addition of motor protective devices such as terminator networks. Refer to *Reflected Wave* in "Wiring and Grounding Guidelines for PWM AC Drives," publication DRIVES-IN001A-EN-P.

Consideration should be given to all of the general specifications dictated by the environment of the installation, including temperature, flexibility, moisture characteristics and chemical resistance. In addition, a braided shield should be included and be specified by the cable manufacturer as having coverage of at least 75%. An additional foil shield can greatly improve noise containment.

A good example of recommended cable is Belden® 295xx (xx determines gauge). This cable has four (4) XLPE insulated conductors with a 100% coverage foil and an 85% coverage copper braided shield (with drain wire) surrounded by a PVC jacket.

Other types of shielded cable are available, but the selection of these types may limit the allowable cable length. Particularly, some of the newer cables twist 4 conductors of THHN wire and wrap them tightly with a foil shield. This construction can greatly increase the cable charging current required and reduce the overall drive performance. Unless specified in the individual distance tables as tested with the drive, these cables are not recommended and their performance against the lead length limits supplied is not known.

Location	Rating/Type	Description
Standard (Option 1)	600V, 90° C (194° F) XHHW2/RHW-2 Anixter B209500-B209507, Belden 29501-29507, or equivalent	• Four tinned copper conductors with XLP insulation. • Copper braid/aluminum foil combination shield and tinned copper drain wire. • PVC jacket.
Standard (Option 2)	Tray rated 600V, 90° C (194° F) RHH/RHW-2 Anixter OLF-7xxxxx or equivalent	• Three tinned copper conductors with XLPE insulation. • 5 mil single helical copper tape (25% overlap min.) with three bare copper grounds in contact with shield. • PVC jacket.
Class I & II; Division I & II	Tray rated 600V, 90° C (194° F) RHH/RHW-2 Anixter 7V-7xxxx-3G or equivalent	• Three bare copper conductors with XLPE insulation and impervious corrugated continuously welded aluminum armor. • Black sunlight resistant PVC jacket overall. • Three copper grounds on #10 AWG and smaller.

208 Volt AC Input Recommended Protection Devices (See page 27 for Notes)

Drive Catalog Number	Frame	HP Rating		Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (4)	140M Motor Starter with Adjustable Current Range (5) (6)				Power Dissapation
		ND	HD	Amps	kVA	Cont.	1 Min.	3 Sec.	Min. (1)	Max. (2)	Min. (1)	Max. (2)	Amps	Amps	Available Catalog Numbers (7)				Watts
208 Volt AC Input																			
20BB2P2	0	0.5	0.33	1.9	0.7	2.5	2.8	3.8	3	6	3	10	15	3	140M-C2E-B25	140M-D8E-B25	–	–	NA
20BB4P2	0	1	0.75	3.7	1.3	4.8	5.6	7.0	6	10	6	17.5	15	7	140M-C2E-B63	140M-D8E-B63	–	–	NA
20BB6P8	1	2	1.5	6.8	2.4	7.8	10.4	13.8	10	15	10	30	30	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–	NA
20BB9P6	1	3	2	9.5	3.4	11	12.1	17	12	20	12	40	40	15	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–	NA
20BB015	1	5	3	15.7	5.7	17.5	19.3	26.3	20	35	20	70	70	30	140M-C2E-C20	140M-D8E-C20	140M-F8E-C20	–	NA
20BB022	1	7.5	5	23.0	8.3	25.3	27.8	38	30	50	30	100	100	30	140M-C2E-C25	140M-D8E-C25	140M-F8E-C25	140M-CMN-2500	NA
20BB028	2	10	7.5	29.6	10.7	32.2	38	50.6	40	70	40	125	125	50	–	–	140M-F8E-C32	140M-CMN-4000	NA
20BB042	3	15	10	44.5	16.0	48.3	53.1	72.5	60	100	60	175	175	70	–	–	140M-F8E-C45	140M-CMN-6300	NA
20BB052	3	20	15	51.5	17.1	56	64	86	80	125	80	200	200	100		–	–	140M-CMN-6300	NA
20BB070	4	25	20	NA		78.2	86	117.3	NA - Data Not Available at Time of Printing										NA
20BB080	4	30	25	NA		92	117.3	156.4	NA - Data Not Available at Time of Printing										NA
20BB104	5	–	30	84.7	28	92	138	175	125	200	125	350	300	150	–	–	–	140M-CMN-9000	NA
		40	–	113	37.5	120	132	175	150	250	150	475	350	150	–	–	–	–	NA
20BB130	5	–	40	98	32.4	104	156	175	125	225	125	400	300	150	–	–	–	–	NA
		50	–	122	40.6	130	143	175	175	275	175	500	375	250	–	–	–	–	NA
20BB154	6	60	50	NA		154	NA - Data Not Available at Time of Printing												
20BB192	6	75	60	NA		192	NA - Data Not Available at Time of Printing												

240 Volt AC Input Recommended Protection Devices (See page 27 for Notes)

Drive Catalog Number	Frame	HP Rating		Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (4)	140M Motor Starter with Adjustable Current Range (5) (6)				Power Dissapation
		ND	HD	Amps	kVA	Cont.	1 Min.	3 Sec.	Min. (1)	Max. (2)	Min. (1)	Max. (2)	Amps	Amps	Available Catalog Numbers (7)				Watts
240 Volt AC Input																			
20BB2P2	0	0.5	0.33	1.7	0.7	2.2	2.4	3.3	3	6	3	10	15	3	140M-C2E-B25	140M-D8E-B25	–	–	NA
20BB4P2	0	1	0.75	3.3	1.4	4.2	4.8	6.4	5	8	5	15	15	7	140M-C2E-B63	140M-D8E-B63	–	–	NA
20BB6P8	1	2	1.5	5.9	2.4	6.8	9	12	10	15	10	25	25	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–	NA
20BB9P6	1	3	2	8.3	3.4	9.6	10.6	14.4	12	20	12	35	35	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–	NA
20BB015	1	5	3	13.7	5.7	15.3	16.8	23	20	30	20	60	60	30	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–	NA
20BB022	1	7.5	5	19.9	8.3	22	24.2	33	25	50	25	80	80	30	140M-C2E-C25	140M-D8E-C25	140M-F8E-C25	140M-CMN-2500	NA
20BB028	2	10	7.5	25.7	10.7	28	33	44	35	60	35	100	100	50	–	–	140M-F8E-C32	140M-CMN-4000	NA
20BB042	3	15	10	38.5	16.0	42	46.2	63	50	90	50	150	150	50	–	–	140M-F8E-C45	140M-CMN-6300	NA
20BB052	3	20	15	47.7	18.2	52	63	80	60	100	60	200	200	100	–	–	–	140M-CMN-6300	NA
20BB070	4	25	20	NA		70	78	105	NA - Data Not Available at Time of Printing										NA
20BB080	4	30	25	NA		80	105	136	NA - Data Not Available at Time of Printing										NA
20BB104	5	–	30	73	28	80	120	160	100	175	100	300	300	100	–	–	–	140M-CMN-9000	NA
		40	–	98	37.3	104	115	175	125	225	125	400	300	150	–	–	–	–	NA
20BB130	5	–	40	98	37.3	104	156	175	125	225	125	400	300	150	–	–	–	–	NA
		50	–	122	47	130	143	175	175	275	175	500	375	250	–	–	–	–	NA
20BB154	6	60	50	NA		154	NA - Data Not Available at Time of Printing												
20BB192	6	75	60	NA		192	NA - Data Not Available at Time of Printing												

400 Volt AC Input Recommended Protection Devices (See page 27 for Notes)

Drive Catalog Number	Frame	kW Rating		Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (4)	140M Motor Starter with Adjustable Current Range (5) (6)				Power Dissapation
		ND	HD	Amps	kVA	Cont.	1 Min.	3 Sec.	Min. (1)	Max. (2)	Min. (1)	Max. (2)	Amps	Amps	Available Catalog Numbers (7)				Watts
400 Volt AC Input																			
20BC1P3	0	0.37	0.25	1.1	0.77	1.3	1.4	1.9	3	3	3	6	15	3	140M-C2E-B16	–	–	–	53
20BC2P1	0	0.75	0.55	1.8	1.3	2.1	2.4	3.2	3	6	3	8	15	3	140M-C2E-B25	140M-D8E-B25	–	–	63
20BC3P5	0	1.5	0.75	3.2	2.2	3.5	4.5	6.0	6	7	6	12	15	7	140M-C2E-B40	140M-D8E-B40	–	–	76
20BC5P0	0	2.2	1.5	4.6	3.2	5.0	5.5	7.5	6	10	6	20	20	7	140M-C2E-B63	140M-D8E-B63	–	–	93
20BC8P7	0	4	2.2	7.9	5.5	8.7	9.9	13.2	15	17.5	15	30	30	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–	164
20BC011	0	5.5	4	10.8	7.5	11.5	13	17.4	15	25	15	45	45	15	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–	194
20BC015	1	7.5	5.5	14.4	10.0	15.4	17.2	23.1	20	30	20	60	60	20	140M-C2E-C20	140M-D8E-C20	140M-F8E-C20	–	218
20BC022	1	11	7.5	20.6	14.3	22	24.2	33	30	45	30	80	80	30	140M-C2E-C25	140M-D8E-C25	140M-F8E-C25	–	326
20BC030	2	15	11	28.4	19.7	30	33	45	35	60	35	120	120	50	–	–	140M-F8E-C32	–	394
20BC037	2	18.5	15	35.0	24.3	37	45	60	45	80	45	125	125	50	–	–	140M-F8E-C45	–	441
20BC043	3	22	18.5	40.7	28.2	43	56	74	60	90	60	150	150	60	–	–	–	–	459
20BC056	3	30	22	53	36.7	56	64	86	70	125	70	200	200	100	–	–	–	–	610
20BC072	3	37	30	68.9	47.8	72	84	112	90	150	90	250	250	100	–	–	–	–	717
20BC085 (8)	4	–	37	68.9	47.8	72	108	144	110	175	110	300	300	150	–	–	–	–	717
		45	–	81.4	56.4	85	94	128	110	175	110	300	300	150	–	–	–	–	974
20BC105	5	–	45	81.4	56.4	85	128	170	110	175	110	300	300	150	–	–	–	–	974
		55	–	100.5	69.6	105	116	158	125	225	125	400	300	150	–	–	–	–	1060
20BC125	5	–	45	91.9	63.7	96	144	168	125	200	125	375	375	150	–	–	–	–	1021
		55	–	121.1	83.9	125	138	163	150	275	150	500	375	250	–	–	–	–	1146
20BC140		–	55	101	76	105	158	210	150	225	150	400	300	150	–	–	–	–	1060
		75	–	136	103	140	154	210	200	300	200	550	400	250	–	–	–	–	NA
20BC170	6	–	75	136	103	140	210	280	200	300	200	550	400	250	–	–	–	–	NA
		90	–	164	126	170	187	255	250	375	250	600	500	250	–	–	–	–	NA
20BC205 (9)	6	–	90	164	126	170	255	313	250	375	250	600	500	250	–	–	–	–	NA
		110	–	199	148	205	220	289	275	450	275	600	600	400	–	–	–	–	NA

480 Volt AC Input Recommended Protection Devices (See page 27 for Notes)

Drive Catalog Number	Frame	HP Rating		Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (4)	140M Motor Starter with Adjustable Current Range (5) (6)				Power Dissapation
		ND	HD	Amps	kVA	Cont.	1 Min.	3 Sec.	Min. (1)	Max. (2)	Min. (1)	Max. (2)	Amps	Amps	Available Catalog Numbers (7)				Watts
480 Volt AC Input																			
20BD1P1	0	0.5	0.33	0.9	0.7	1.1	1.2	1.6	3	3	3	6	15	3	140M-C2E-B16	–	–	–	53
20BD2P1	0	1	0.75	1.6	1.4	2.1	2.4	3.2	3	6	3	8	15	3	140M-C2E-B25	–	–	–	63
20BD3P4	0	2	1.5	2.6	2.2	3.4	4.5	6.0	4	8	4	12	15	7	140M-C2E-B40	140M-D8E-B40	–	–	76
20BD5P0	0	3	2	3.9	3.2	5.0	5.5	7.5	6	10	6	20	20	7	140M-C2E-C63	140M-D8E-B63	–	–	93
20BD8P0	0	5	3	6.9	5.7	8.0	8.8	12	10	15	10	30	30	15	140M-C2E-C10	140M-D8E-C10	140M-F8E-C10	–	164
20BD011	0	7.5	5	9.5	7.9	11	12.1	16.5	15	20	15	40	40	15	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–	194
20BD014	1	10	7.5	12.5	10.4	14	16.5	22	17.5	30	17.5	50	50	20	140M-C2E-C16	140M-D8E-C16	140M-F8E-C16	–	218
20BD022	1	15	10	19.9	16.6	22	24.2	33	25	50	25	80	80	30	140M-C2E-C25	140M-D8E-C25	140M-F8E-C25	140-CMN-2500	326
20BD027	2	20	15	24.8	20.6	27	33	44	35	60	35	100	100	50	–	–	140M-F8E-C32	140-CMN-4000	394
20BD034	2	25	20	31.2	25.9	34	40.5	54	40	70	40	125	125	50	–	–	140M-F8E-C45	140-CMN-4000	441
20BD040	3	30	25	36.7	30.5	40	51	68	50	90	50	150	150	50	–	–	140M-F8E-C45	140-CMN-4000	459
20BD052	3	40	30	47.7	39.7	52	60	80	60	110	60	200	200	70	–	–	–	140M-CMN-6300	610
20BD065	3	50	40	59.6	49.6	65	78	104	75	125	75	250	250	100	–	–	–	140M-CMN-9000	717
20BD077	4	–	50	59.6	49.6	65	98	130	100	170	100	300	300	100	–	–	–	140M-CMN-9000	717
		60	–	72.3	60.1	77	85	116	100	170	100	300	300	100	–	–	–	140M-CMN-9000	974
20BD096	5	–	60	72.3	60.1	77	116	154	100	170	100	300	300	100	–	–	–	140M-CMN-9000	974
		75	–	90.1	74.9	96	106	144	125	200	125	350	350	125	–	–	–	–	1146
20BD125	5	–	75	90.1	74.9	96	144	168	125	200	125	350	350	125	–	–	–	–	1146
		100	–	117	97.6	125	138	163	150	250	150	500	375	150	–	–	–	–	1475
20BD156	6	–	100	131	109	125	188	250	175	250	175	500	375	250	–	–	–	–	NA
		125	–	147	122	156	172	234	200	350	200	600	450	250	–	–	–	–	NA
20BD180	6	–	125	147	122	156	234	312	200	350	200	600	450	250	–	–	–	–	NA
		150	–	169	141	180	198	270	225	400	225	600	500	250	–	–	–	–	NA

600 Volt AC Input Recommended Protection Devices (See Notes below)

Drive Catalog Number	Frame	HP Rating		Input Ratings		Output Amps			Dual Element Time Delay Fuse		Non-Time Delay Fuse		Circuit Breaker (3)	Motor Circuit Protector (4)	140M Motor Starter with Adjustable Current Range (5) (6)				Power Dissapation
		ND	HD	Amps	kVA	Cont.	1 Min.	3 Sec.	Min. (1)	Max. (2)	Min. (1)	Max. (2)	Amps	Amps	Available Catalog Numbers (7)				Watts
600 Volt AC Input																			
20BE011	1	10	7.5	9.9	10.2	11	13.5	18	15	25	15	40	40	15	–	–	–	–	NA
20BE017	1	15	10	15.4	16.0	17	18.7	25.5	20	40	20	60	60	20	–	–	–	–	NA
20BE022	2	20	15	20.2	21.0	22	25.5	34	30	50	30	80	80	30	–	–	–	–	NA
20BE027	2	25	20	24.8	25.7	27	33	44	35	60	35	100	100	50	–	–	–	–	NA
20BE032	3	30	25	29.4	30.5	32	40.5	54	40	70	40	125	125	50	–	–	–	–	NA
20BE041	3	40	30	37.6	39.1	41	48	64	50	90	50	150	150	50	–	–	–	–	NA
20BE052	3	50	40	47.7	49.6	52	61.5	82	60	110	60	200	200	100	–	–	–	–	NA
20BE062	4	60	50	NA		62	NA - Data Not Available at Time of Printing								–	–	–	–	NA
20BE077	5	75	60	NA		77	NA - Data Not Available at Time of Printing								–	–	–	–	NA

Notes:

(1) Minimum protection device size is the lowest rated device that supplies maximum protection without nuisance tripping.

(2) Maximum protection device size is the highest rated device that supplies drive protection. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.

(3) Circuit Breaker - inverse time breaker. For US NEC, minimum size is 125% of motor FLA. Ratings shown are maximum.

(4) Motor Circuit Protector - instantaneous trip circuit breaker. For US NEC minimum size is 125% of motor FLA. Ratings shown are maximum.

(5) Bulletin 140M with adjustable current range should have the current trip set to the minimum range that the device will not trip.

(6) Manual Self-Protected (Type E) Combination Motor Controller, UL listed for 208 Wye or Delta, 240 Wye or Delta, 480Y/277 or 600Y/ 347. Not UL listed for use on 480V or 600V Delta/Delta systems.

(7) The AIC ratings of the Bulletin 140M Motor Protector may vary. See publication 140M-SG001B-EN-P.

(8) 20BC085 current rating is limited to 45 ° C surrounding air.

(9) 20BC205 current rating is limited to 40 ° C surrounding air.

Power Ratings, Branch Circuit Protection and Power Dissipation, Cont'd

650 Volt DC Input Recommended Protection Devices

Drive Catalog Number	Frame	HP Rating		DC Input Ratings		Output Amps			Fuse	Bussmann Style Fuse or Equivalent
		ND	*HD*	*Amps*	*kWA*	*Cont.*	*1 Min.*	*3 Sec.*		
650 Volt DC Input										
20BD1P1	0	0.5	0.33	0.9	0.7	1.1	1.2	1.6	6	BUSSMANN_JKS-6
20BD2P1	0	1	0.75	1.6	1.4	2.1	2.4	3.2	6	BUSSMANN_JKS-6
20BD3P4	0	2	1.5	2.6	2.2	3.4	4.5	6.0	6	BUSSMANN_JKS-6
20BD5P0	0	3	2	3.9	3.2	5.0	5.5	7.5	10	BUSSMANN_JKS-10
20BD8P0	0	5	3	6.9	5.7	8.0	8.8	12	15	BUSSMANN_JKS-15
20BD011	0	7.5	5	9.5	7.9	11	12.1	16.5	20	BUSSMANN_JKS-20
20BD014	1	10	7.5	12.5	10.4	14	16.5	22	30	BUSSMANN_JKS-30
20BD022	1	15	10	19.9	16.6	22	24.2	33	45	BUSSMANN_JKS-45
20BD027	2	20	15	24.8	20.6	27	33	44	60	BUSSMANN_JKS-60
20BD034	2	25	20	31.2	25.9	34	40.5	54	70	BUSSMANN_JKS-70
20BD040	3	30	25	36.7	30.5	40	51	68	80	BUSSMANN_JKS-80
20BD052	3	40	30	47.7	39.7	52	60	80	100	BUSSMANN_JKS-100
20BD065	3	50	40	59.6	49.6	65	78	104	150	BUSSMANN_JKS-150
20BR077	4	–	50	59.6	49.6	65	98	130	150	BUSSMANN_JKS-150
	4	60	–	72.3	60.1	77	85	116	150	BUSSMANN_JKS-150
20BR096	5	–	60	72.3	60.1	77	116	154	150	BUSSMANN_JKS-150
		75	–	90.1	74.9	96	106	144	200	BUSSMANN_JKS-200
20BR125	5	–	75	90.1	74.9	96	144	168	200	BUSSMANN_JKS-200
		100	–	117	97.6	125	138	163	250	BUSSMANN_JKS-250
20BR156	6	–	100	131	109	125	188	250	250	BUSSMANN_JKS-250
		125	–	147	122	156	172	234	300	BUSSMANN_JKS-300
20BR180	6	–	125	147	122	156	234	312	300	BUSSMANN_JKS-300
		150	–	169	141	180	198	270	400	BUSSMANN_JKS-400

Maximum Motor Cable Lengths (in feet)

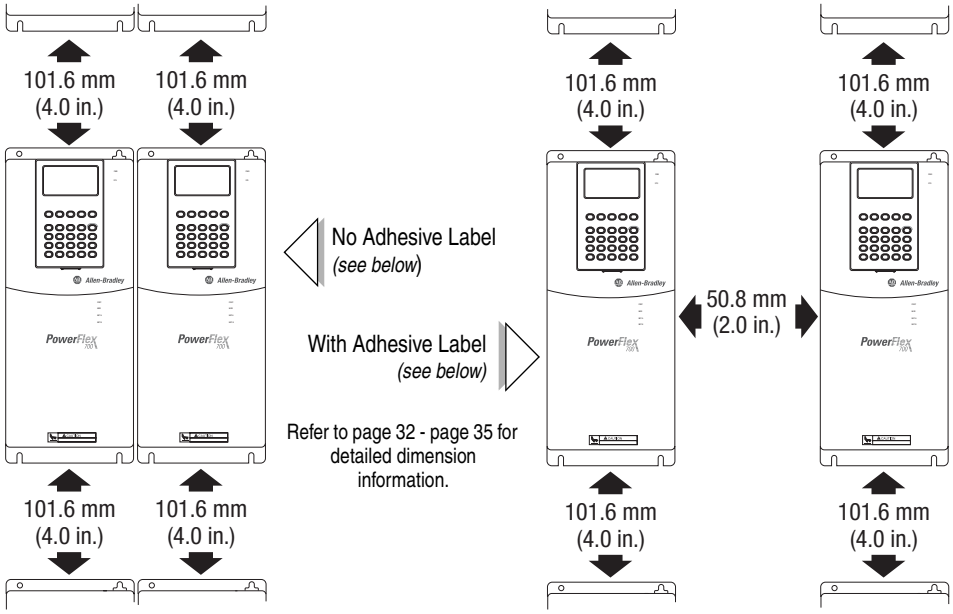
480V HP Rating	Carrier Freq. *(kHz)*	1000 volt motor			1200 volt motor			1488 volt motor NEMA MG1-1998		
		Shielded	Shielded	Unshielded	Shielded	Shielded	Unshielded	Shielded	Shielded	Unshielded
0.5	4	50	25	75	50	220	320	220	420	NA
	8	40	20	75	40	220	220	220	420	NA
1	4	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
2	4	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
3	4	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
5	4	25	25	75	40	420	520	420	620	NA
	8	25	25	75	40	420	275	420	520	NA
7.5	4	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
10	4	NA	NA	NA	NA	NA	NA	NA	NA	NA
	8	NA	NA	NA	NA	NA	NA	NA	NA	NA
15	4	20	20	40	50	420	620	420	620	NA
	8	20	20	40	40	420	520	420	520	NA
25	4	20	20	40	50	620	620	620	620	NA
	8	20	20	40	40	620	420	620	620	NA

Notes:

(1) 1000V motor is defined as one assembled without phase paper. 1200V motor is defined as one assembled with phase paper. 1488V motor meets NEMA MG 1-1998 section 31 standard where the insulation can withstand voltage spikes of 3.1 x rated motor voltage due to inverter operation (inverter duty motor). 1600V motor is a 1329R or 1329L. Operation at nominal line voltage. To increase the distance between the drive and the motor, some mitigation device needs to be added to the system (i.e. an RWR or Terminator).

(2) NA = Data Not Available at time of publication.

Mounting



Operating Temperatures

PowerFlex 700 drives are designed to operate at 0° to 40° C surrounding air.
To operate the drive in installations between 41° and 50° C, refer to the table below.

Acceptable Surrounding Air Temperature & Required Actions

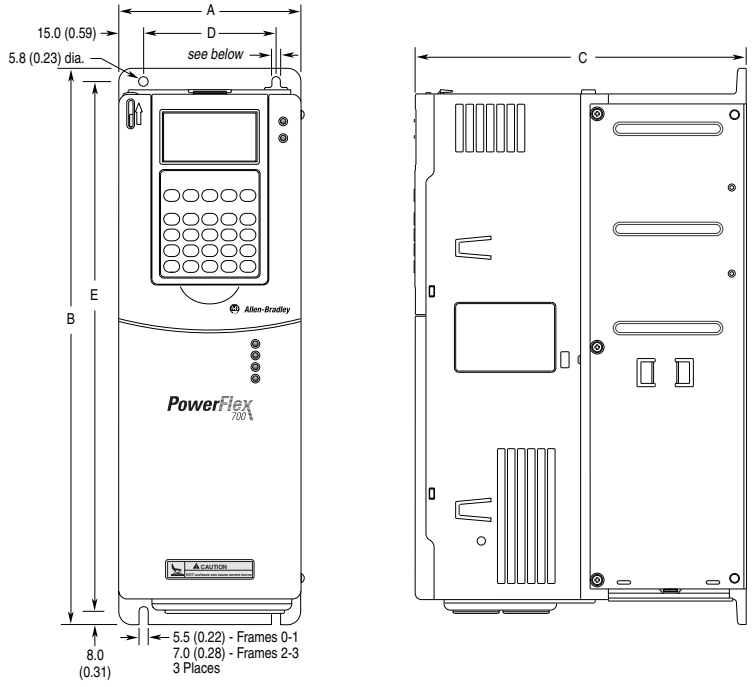
	Required Action . . .		
	IP 20, NEMA Type 1	IP 20, NEMA Type Open	IP 00, NEMA Type Open
Drive Catalog Number	*No Action Required*	*Remove Top Label*	*Remove Top Label & Vent Plate*
All *Except* 20BC072	40° C	50° C	NA
20BC072	40° C	45° C	50° C

Approximate Dimensions

PowerFlex 700 Frames

Frame	208/240V AC Input		400V AC Input		480V AC Input		600V AC Input	
	ND HP	HD HP	ND kW	HD kW	ND HP	HD HP	ND HP	HD HP
0	0.5	0.33	0.37	0.25	0.5	0.33	–	–
	1	0.75	0.75	0.55	1	0.75	–	–
	–	–	1.5	0.75	2	1.5	–	–
	–	–	2.2	1.5	3	2	–	–
	–	–	4	2.2	5	3	–	–
	–	–	5.5	4	7.5	5	–	–
1	2	1.5	7.5	5.5	10	7.5	10	7.5
	3	2	11	7.5	15	10	15	10
	5	3	–	–	–	–	–	–
	7.5	5	–	–	–	–	–	–
2	10	7.5	15	11	20	15	20	15
	–	–	18.5	15	25	20	25	20
3	15	10	22	18.5	30	25	30	25
	20	15	30	22	40	30	40	30
	–	–	37	30	50	40	50	40
4	25	20	45	37	60	50	60	50
	30	25	–	–	–	–	–	–
5	40	30	55	45	75	60	75	60
	50	40	–	–	100	75	–	–
6	60	50	75	55	125	100	–	–
	75	60	90	75	150	125	–	–
	–	–	110	90	–	–	–	–

PowerFlex 700 Frames 0-3



Dimensions are in millimeters and (inches). Weights are in kilograms and (pounds).

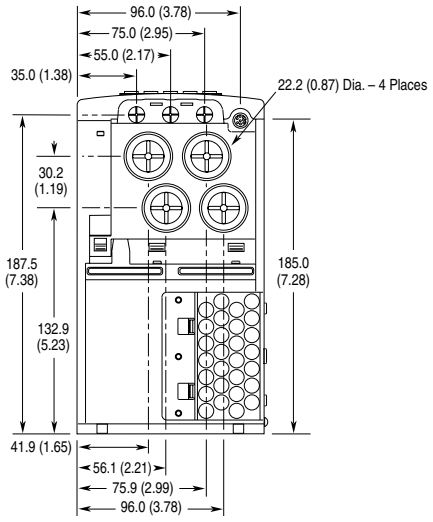
Frame	A	B	C	D	E	Weight ❶ *kg (lbs.)*	
						Drive	Drive & Packaging
0	110.0 (4.33)	336.0 (13.23)	200.0 (7.87)	80.0 (3.15)	320.0 (12.60)	5.22 (11.5)	8.16 (18)
1	135.0 (5.31)	336.0 (13.23)	200.0 (7.87)	105.0 (4.13)	320.0 (12.60)	7.03 (15.5)	9.98 (22)
2	222.0 (8.74)	342.5 (13.48)	200.0 (7.87)	192.0 (7.56)	320.0 (12.60)	12.52 (27.6)	15.20 (33.5)
3	222.0 (8.74)	517.5 (20.37)	200.0 (7.87)	192.0 (7.56)	500.0 (19.69)	18.55 (40.9)	22.68 (50)

❶ Weights include HIM and Standard I/O.

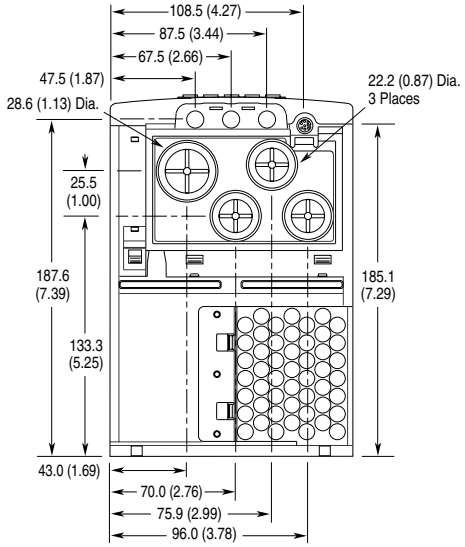
Approximate Dimensions, Cont'd

PowerFlex 700 Frames 0-3 Bottom View Dimensions

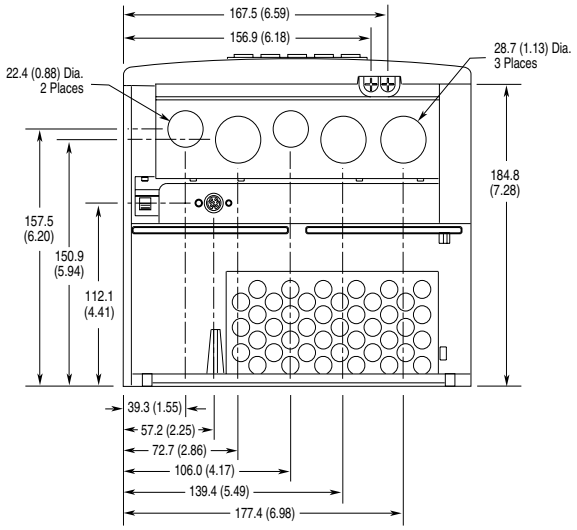
Frame 0



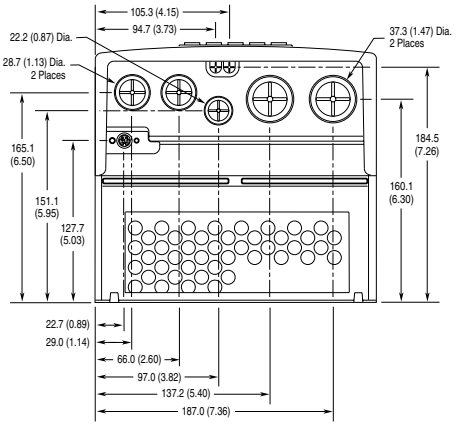
Frame 1



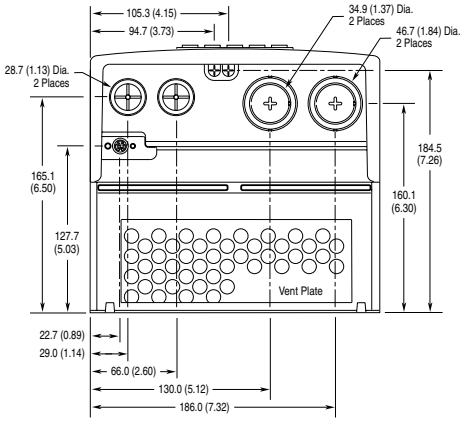
Frame 2



Frame 3 - All Drives except 50 HP, 480V (37 kW, 400V)

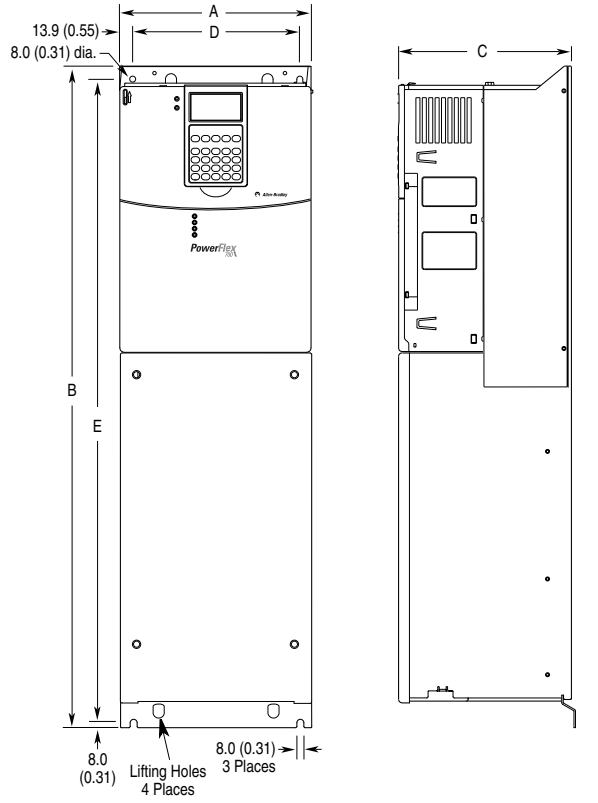


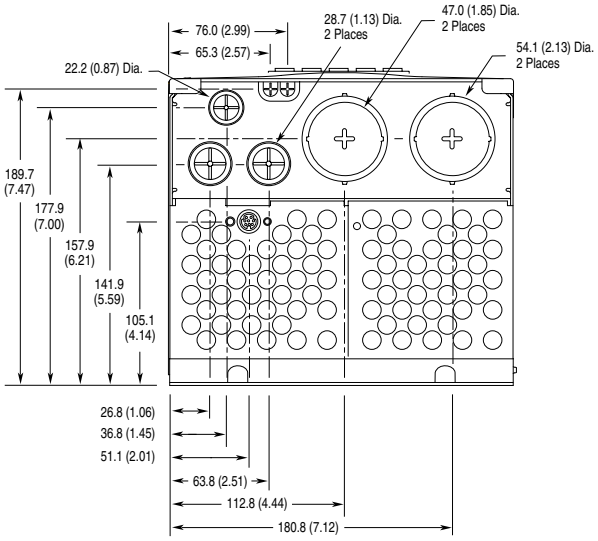
Frame 3 - 50 HP, 480V (37 kW, 400V), Normal Duty Drive



Approximate Dimensions, Cont'd

PowerFlex 700 Frame 4 Dimensions



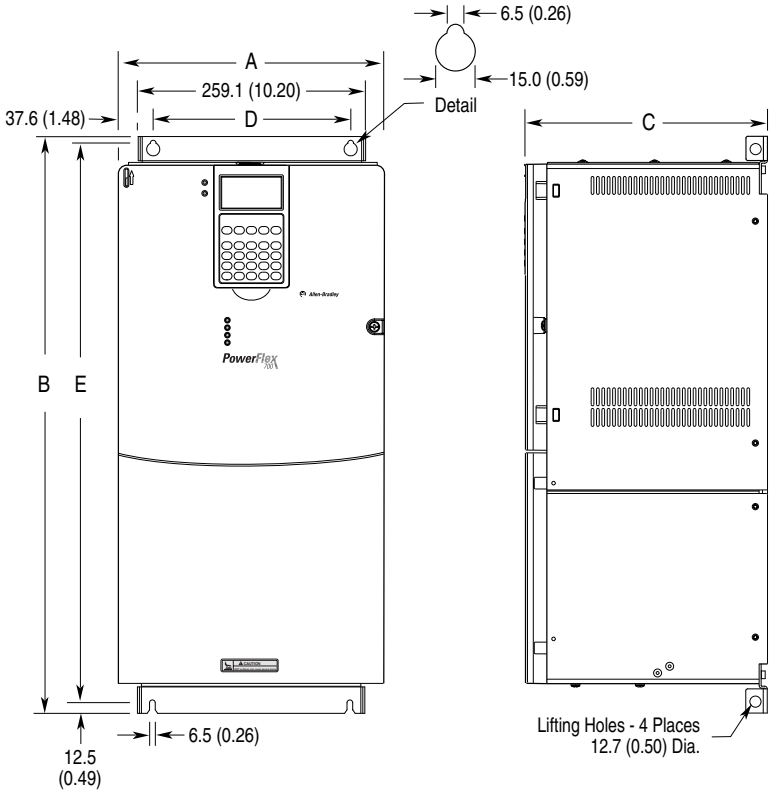


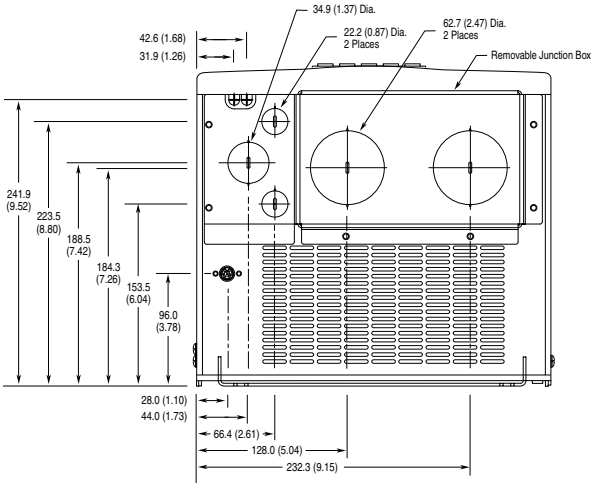
Frame	A *(Max.)*	B	C *(Max.)*	D	E	Approx. Weight (1) *kg (lbs.)*	
						Drive	Drive & Packaging
4	219.8 (8.65)	758.9 (29.88)	201.6 (7.94)	192.0 (7.56)	738.2 (29.06)	24.49 (54.0)	29.03 (64.0)

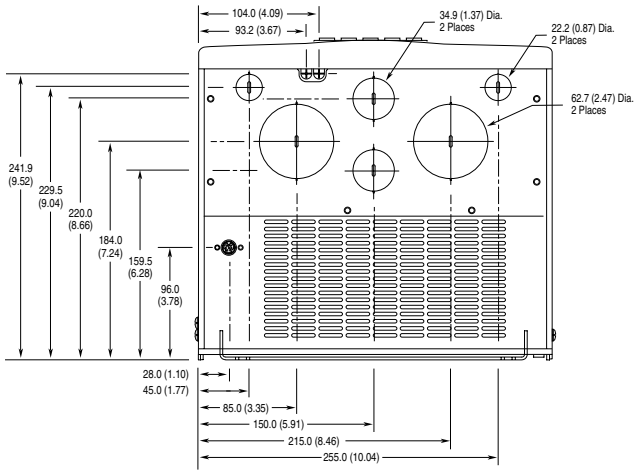
(1) Weights include HIM and Standard I/O.

Approximate Dimensions, Cont'd

PowerFlex 700 Frame 5 Dimensions



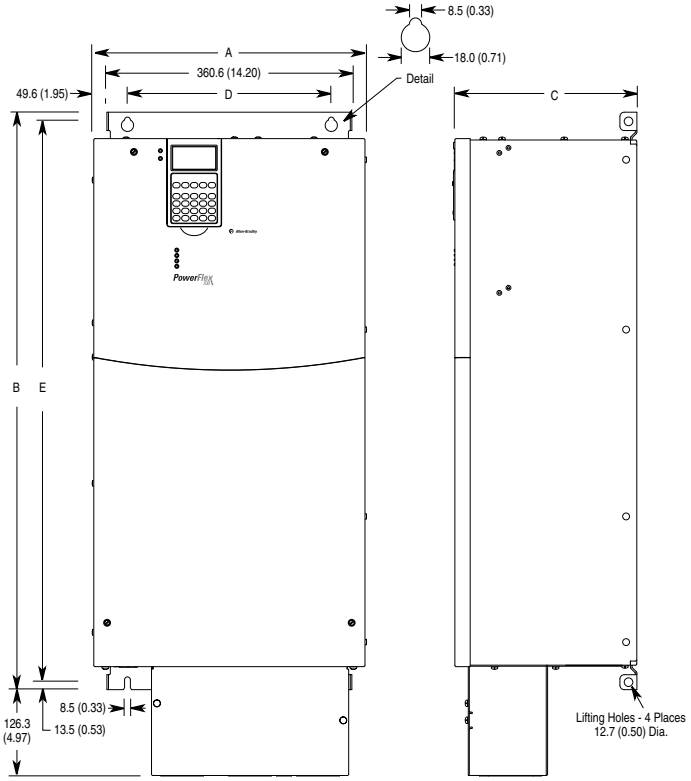


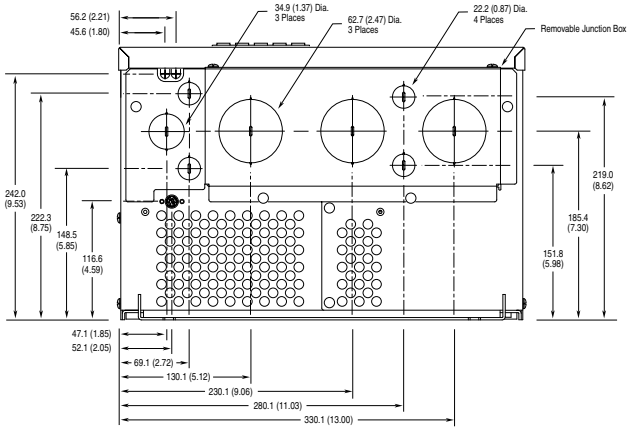


Frame	A	B	C	D	E	Weight ❶ kg (lbs.) Drive	
						Drive	Drive & Packaging
5	308(12.16)	644.5(25.37)	275.4(10.84)	225.0(24.61)	625.0(24.61)	37.19(82.0)	42.18(93.0)

Approximate Dimensions, Cont'd

PowerFlex 700 Frame 6 Dimensions





Frame	A *(Max.)*	B	C *(Max.)*	D	E	Approx. Weight (1) *kg (lbs.)*	
						Drive	Drive & Packaging
6	403.9 (15.90)	850.0 (33.46)	275.5 (10.85)	300.0 (11.81)	825.0 (32.48)	37.19 (82.0)	42.18 (93.0)

(1) Weights include HIM and Standard I/O.

Control and Performance

Category	Specification						
Protection	**Drive**	**200-208V**	**240V**	**380/400**	**480V**	**600V**	**690V**
	AC Input Overvoltage Trip:	247VAC	285VAC	475VAC	570VAC	690VAC	
	AC Input Undervoltage Trip:	120VAC	138VAC	233VAC	280VAC	345VAC	
	Bus Overvoltage Trip:	405VDC	405VDC	810VDC	810VDC	1013VDC	
	Bus Undervoltage Shutoff/Fault:	153VDC	153VDC	305VDC	305VDC	381VDC	
	Nominal Bus Voltage:	281VDC	324VDC	540VDC	648VDC	810VDC	
	All Drives						
	Heat Sink Thermistor:	Monitored by microprocessor overtemp trip					
	Drive Overcurrent Trip Software Overcurrent Trip: Hardware Overcurrent Trip:	 200% of rated current (typical) 220-300% of rated current (dependent on drive rating)					
	Line transients:	up to 6000 volts peak per IEEE C62.41-1991					
	Control Logic Noise Immunity:	Showering arc transients up to 1500V peak					
	Power Ride-Thru:	15 milliseconds at full load					
	Logic Control Ride-Thru:	0.5 seconds minimum, 2 seconds typical					
	Ground Fault Trip:	Phase-to-ground on drive output					
	Short Circuit Trip:	Phase-to-phase on drive output					
Environment	Altitude:	1000 m (3300 ft) max. without derating					
	Maximum Surrounding Air Temperature without Derating: IP20, NEMA Type 1: IP56, NEMA Type 4X	 0 to 50° C (32 to 122° F)) 0 to 50° C (32 to 122° F)					
	Storage Temperature (all const.):	–40 to 70° C (–40 to 158° F)					
	Atmosphere	**Important:** Drive **must not** be installed in an area where the surrounding air atmosphere contains volatile or corrosive gas, vapors or dust. If the drive is not going to be installed for a period of time, it must be stored in an area where it will not be exposed to a corrosive atmosphere.					
	Relative Humidity:	5 to 95% non-condensing					
	Shock:	15G peak for 11ms duration (±1.0 ms)					
	Vibration:	0.152 mm (0.006 in.) displacement, 1G peak					
Agency Certification	The drive is designed to meet the following specifications: NFPA 70 - US National Electrical Code NEMA ICS 3.1 - Safety standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems. NEMA 250 - Enclosures for Electrical Equipment IEC 146 - International Electrical Code.						
	c UL us	UL and cUL Listed to UL508C and CAN/CSA-C2.2 No. 14-M91					
	CE	Marked for all applicable European Directives (1) EMC Directive (89/336/EEC) Emissions EN 61800-3 Adjustable Speed electrical power drive systems Part 3 Immunity EN 61800-3 Second Environment, Restricted Distribution Low Voltage Directive (73/23/EEC) EN 50178 Electronic Equipment for use in Power Installations						
Electrical	Voltage Tolerance:	–10% of minimum, +10% of maximum.					
	Frequency Tolerance:	47-63 Hz.					
	Input Phases:	Three-phase input provides full rating for all drives. Single-phase operation provides 50% of rated current.					
	Displacement Power Factor	0.98 across speed range.					
	Efficiency:	97.5% at rated amps, nominal line volts.					
	Max. Short Circuit Current Rating: Using Recommended Fuse or Circuit Breaker Type	Maximum short circuit current rating to match specified fuse/circuit breaker capability.					

Specifications

Category	Specification	
Control	Method:	Sine coded PWM with programmable carrier frequency. Ratings apply to all drives. The drive can be supplied as 6 pulse or 12 pulse in a configured package.
	Carrier Frequency	2, 4, 8 & 10 kHz. Drive rating based on 4 kHz
	Output Voltage Range:	0 to rated motor voltage
	Output Frequency Range:	Standard Control – 0 to 400 Hz., Vector Control – 0 to 420 Hz.
	Frequency Accuracy Digital Input: Analog Input:	 Within ±0.01% of set output frequency. Within ±0.4% of maximum output frequency.
	Frequency Control	Speed regulation - with Slip Compensation 0.5% of base speed across 40:1 speed range 40:1 operating range 10 rad/sec bandwidth — Standard, Vector
		Speed regulation - with Slip Compensation 0.5% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth — Standard, Vector
		Speed regulation - with feedback 0.1% of base speed across 80:1 speed range 80:1 operating range 20 rad/sec bandwidth — Vector
	Speed Control	Speed regulation - without feedback 0.1% of base speed across 120:1 speed range 120:1 operating range 50 rad/sec bandwidth — Vector
		Speed regulation - with feedback 0.001% of base speed across 120:1 speed range 1000:1 operating range 250 rad/sec bandwidth — Vector
	Torque Regulation	Torque Regulation - without feedback +/-10%, 600 rad/sec bandwidth — Vector
		Torque Regulation - with feedback +/-5%, 2500 rad/sec bandwidth — Vector
	Selectable Motor Control:	Sensorless Vector with full tuning. Standard V/Hz with full custom capability and vector control.
	Stop Modes:	Multiple programmable stop modes including - Ramp, Coast, DC-Brake, Ramp-to-Hold and S-curve.
	Accel/Decel:	Two independently programmable accel & decel times. Each time may be programmed from 0-3600 seconds in 0.1 sec. increments
	Intermittent Overload:	110% Overload capability for up to 1 minute 150% Overload capability for up to 3 seconds
	Current Limit Capability:	Proactive Current Limit programmable from 20 to 160% of rated output current. Independently programmable proportional and integral gain.
	Electronic Motor Overload Protection	Class 10 protection with speed sensitive response. Investigated by U.L. to comply with N.E.C. Article 430. U.L. File E59272, volume 12.
Encoder	Type:	Incremental, dual channel
	Supply:	12V, 500 mA. 12V, 10 mA minimum inputs isolated with differential transmitter, 250 kHz maximum.
	Quadrature:	90° +/–27° at 25° C.
	Duty Cycle:	50% +10%
	Requirements:	Encoders must be line driver type, quadrature (dual channel) or pulse (single channel), 8-15V DC output, single-ended or differential and capable of supplying a minimum of 10 mA per channel. Maximum input frequency is 250 kHz. The Encoder Interface Board accepts 12V DC square-wave with a minimum high state voltage of 7.0V DC (12 volt encoder). Maximum low state voltage is 0.4V DC.

(1) Applied noise impulses may be counted in addition to the standard pulse train causing erroneously high [Pulse Freq] readings.

Parameters List

Shaded rows denote Vector parameters.

Parameter Name	Number	Group
Accel Mask	281	Masks & Owners
Accel Owner	293	Masks & Owners
Accel Time X	140-141	Ramp Rates
Alarm X @ Fault	229, 230	Diagnostics
Alarm X Code	262-269	Alarms
Alarm Clear	261	Alarms
Alarm Config 1	259	Alarms
Analog In X Hi	322, 325	Analog Inputs
Analog In X Lo	323, 326	Analog Inputs
Analog In X Loss	324, 327	Analog Inputs
Analog InX Value	16, 17	Metering
Analog OutX Hi	343, 346	Analog Outputs
Analog OutX Lo	344, 347	Analog Outputs
Analog OutX Sel	342, 345	Analog Outputs
Anlg In Config	320	Analog Inputs
Anlg In Sqr Root	321	Analog Inputs
Anlg Out Absolut	341	Analog Outputs
Anlg Out Config	340	Analog Outputs
Auto Rstrt Delay	175	Restart Modes
Auto Rstrt Tries	174	Restart Modes
Autotune	61	Torq Attributes
Autotune Torque	66	Torq Attributes
Break Frequency	72	Volts per Hertz
Break Voltage	71	Volts per Hertz
Bus Reg Kd	165	Stop/Brake Modes
Bus Reg Ki	160	Stop/Brake Modes
Bus Reg Kp	164	Stop/Brake Modes
Bus Reg Mode X	161, 162	Stop/Brake Modes
Commanded Freq	2	Metering
Commanded Speed	2	Metering
Commanded Torque	24	Metering
Compensation	56	Torq Attributes
Control Status	440	Torq Attributes
Control SW Ver	29	Drive Data
Current Lmt Gain	149	Load Limits
Current Lmt Sel	147	Load Limits
Current Lmt Val	148	Load Limits
Current Rate Limit	154	Load Limits
Data In XX	300-307	Datalinks
Data Out XX	310-317	Datalinks
DB Resistor Type	163	Stop/Brake Modes
DC Brake Level	158	Stop/Brake Modes
DC Brk Lvl Sel	157	Stop/Brake Modes
DC Brake Time	159	Stop/Brake Modes
DC Bus Memory	13	Metering
DC Bus Voltage	12	Metering
Decel Mask	282	Masks & Owners
Decel Owner	294	Masks & Owners
Decel Time X	142, 143	Ramp Rates
Dig In Status	216	Diagnostics
Dig Out Status	217	Diagnostics
Dig OutX Level	381, 385, 389	Digital Outputs
Dig OutX OffTime	383, 387, 391	Digital Outputs
Dig OutX OnTime	382, 386, 390	Digital Outputs
Digital InX Sel	361-366	Digital Inputs
Digital OutX Sel	380, 384, 388	Digital Outputs
Direction Mask	279	Masks & Owners
Direction Mode	190	Direction Config
Direction Owner	291	Masks & Owners
DPI Baud Rate	270	Comm Control
DPI Data Rate	270	Comm Control
DPI Port Sel	274	Comm Control
DPI Port Value	275	Comm Control
Drive Alarm X	211-212	Diagnostics
Drive Checksum	203	Drive Memory
Drive Logic Rslt	271	Comm Control
Drive OL Count	219	Diagnostics
Drive OL Mode	150	Load Limits
Drive Ramp Rslt	273	Comm Control
Drive Ref Rslt	272	Comm Control
Drive Status X	209, 210	Diagnostics
Drive Temp	218	Diagnostics
Droop RPM @ FLA	152	Load Limits
Elapsed MWh	9	Metering
Elapsed Run Time	10	Metering
Enc Position Fdbk	414	Speed Feedback
Encoder PPR	413	Speed Feedback
Encoder Speed	415	Speed Feedback
Encoder Z Chan	423	Speed Feedback
Fault 1 Code	243	Faults
Fault 1 Time	244	Faults
Fault 2 Code	245	Faults
Fault 2 Time	246	Faults
Fault 3 Code	247	Faults
Fault 3 Time	248	Faults
Fault 4 Code	249	Faults
Fault 4 Time	250	Faults
Fault 5 Code	251	Faults
Fault 5 Time	252	Faults
Fault 6 Code	253	Faults
Fault 6 Time	254	Faults
Fault 7 Code	255	Faults
Fault 7 Time	256	Faults
Fault 8 Code	257	Faults
Fault 8 Time	258	Faults
Fault Amps	225	Diagnostics
Fault Bus Volts	226	Diagnostics
Fault Clear	240	Faults
Fault Clear Mode	241	Faults
Fault Clr Mask	283	Masks & Owners
Fault Clr Owner	295	Masks & Owners
Fault Config 1	238	Faults
Fault Frequency	224	Diagnostics
Fault Speed	224	Diagnostics
Fdbk Filter Sel	416	Speed Feedback
Feedback Select	80	Spd Mode & Limits
Flux Braking	166	Stop/Brake Modes
Flux Current	5	Metering
Flux Current Ref	63	Torq Attributes
Flux Up Mode	57	Torq Attributes
Flux Up Time	58	Torq Attributes
Flying Start En	169	Restart Modes
Flying StartGain	170	Restart Modes
Inertia Autotune	67	Torq Attributes
IR Voltage Drop	62	Torq Attributes
Ixo Voltage Drop	64	Torq Attributes
Jog Mask	278	Masks & Owners
Jog Owner	290	Masks & Owners
Jog Speed/1	100	Discrete Speeds
Jog Speed 2	108	Discrete Speeds
Kf Speed Loop	447	Speed Regulator
Ki Speed Loop	445	Speed Regulator
Kp Speed Loop	446	Speed Regulator
Language	201	Drive Memory
Last Stop Source	215	Diagnostics
Load Frm Usr Set	198	Drive Memory
Local Mask	285	Masks & Owners
Local Owner	297	Masks & Owners
Logic Mask	276	Masks & Owners
Man Ref Preload	193	HIM Ref Config
Marker Pulse	421	Speed Feedback
Maximum Freq	55	Torq Attributes
Maximum Speed	82	Spd Mode & Limits
Maximum Voltage	54	Torq Attributes
Minimum Speed	81	Spd Mode & Limits
MOP Frequency	11	Metering
MOP Mask	284	Masks & Owners
MOP Owner	296	Masks & Owners
MOP Rate	195	MOP Config
MOP Reference	11	Metering
Motor Cntl Sel	53	Torq Attributes
Motor Fdbk Type	412	Speed Feedback
Motor NP FLA	42	Motor Data
Motor NP Hertz	43	Motor Data
Motor NP Power	45	Motor Data
Motor NP RPM	44	Motor Data
Motor NP Volts	41	Motor Data
Motor OL Count	220	Diagnostics
Motor OL Factor	48	Motor Data
Motor OL Hertz	47	Motor Data
Motor Poles	49	Motor Data
Motor Type	40	Motor Data
Mtr NP Pwr Units	46	Motor Data
Mtr Tor Cur Ref	441	Torq Attributes
Neg Torque Limit	437	Torq Attributes
Notch Filter Freq	419	Speed Feedback
Notch Filter K	420	Speed Feedback
Output Current	3	Metering
Output Freq	1	Metering
Output Power	7	Metering
Output Powr Fctr	8	Metering
Output Voltage	6	Metering
Overspeed Limit	83	Spd Mode & Limits
Param Access Lvl	196	Drive Memory
PI Configuration	124	Process PI
PI Control	125	Process PI
PI Error Meter	137	Process PI
PI Fdback Meter	136	Process PI
PI Feedback Hi	462	Process PI
PI Feedback Lo	463	Process PI
PI Feedback Sel	128	Process PI
PI Integral Time	129	Process PI
PI Lower Limit	131	Process PI
PI Output Meter	138	Process PI
PI Preload	133	Process PI
PI Prop Gain	130	Process PI
PI Ref Meter	135	Process PI
PI Reference Hi	460	Process PI
PI Reference Lo	461	Process PI
PI Reference Sel	126	Process PI
PI Setpoint	127	Process PI
PI Status	134	Process PI
PI Upper Limit	132	Process PI
Pos Torque Limit	436	Torq Attributes
Power Loss Level	186	Power Loss
Power Loss Mode	184	Power Loss
Power Loss Time	185	Power Loss
Powerup Delay	167	Restart Modes
Power Up Marker	242	Faults
Preset Speed X	101-107	Discrete Speeds

Parameter List, Cont'd

Parameter Name	Number	Group
Pulse Input Ref	99	Speed Reference
Pulse In Scale	422	Speed Feedback
PWM Frequency	151	Load Limits
Ramped Speed	22	Metering
Rated Amps	28	Drive Data
Rated kW	26	Drive Data
Rated Volts	27	Drive Data
Reference Mask	280	Masks & Owners
Reference Owner	292	Masks & Owners
Regen Power Limit	153	Load Limits
Reset Meters	200	Drive Memory
Reset To Defaults	197	Drive Memory
Rev Speed Limit	454	Speed Regulator
Run Boost	70	Volts per Hertz
S Curve %	146	Ramp Rates
Save HIM Ref	192	HIM Ref Config
Save MOP Ref	194	MOP Config
Save To User Set	199	Drive Memory
ScaleX In Value	476, 482	Scaled Blocks
ScaleX In Hi	477, 483	Scaled Blocks
ScaleX In Lo	478, 484	Scaled Blocks
ScaleX Out Hi	479, 485	Scaled Blocks
ScaleX Out Lo	480, 486	Scaled Blocks
ScaleX Out Value	481, 487	Scaled Blocks
Skip Freq Band	87	Spd Mode & Limits
Skip Frequency X	84-86	Spd Mode & Limits
Sleep Level	182	Restart Modes
Sleep Time	183	Restart Modes
Sleep-Wake Mode	178	Restart Modes
Sleep-Wake Ref	179	Restart Modes
Slip Comp Gain	122	Slip Comp
Slip RPM @ FLA	121	Slip Comp
Slip RPM Meter	123	Slip Comp
Speed Desired BW	449	Speed Regulator
Speed Feedback	25	Metering
Speed Mode	80	Spd Mode & Limits
Speed Ref X Hi	91, 94	Speed Reference
Speed Ref X Lo	92, 95	Speed Reference
Speed Ref X Sel	90, 93	Speed Reference
Speed Ref Source	213	Diagnostics
Speed Reference	23	Metering
Speed Units	79	Spd Mode & Limits
Speed/Torque Mod	88	Spd Mode & Limits
Start At PowerUp	168	Restart Modes
Start Inhibits	214	Diagnostics
Start Mask	277	Masks & Owners
Start Owner	289	Masks & Owners
Start/Acc Boost	69	Volts per Hertz
Status X @ Fault	227, 228	Diagnostics
Stop Mode A	155	Stop/Brake Modes
Stop Mode B	156	Stop/Brake Modes
Stop Owner	288	Masks & Owners
Stop/BRK Mode A	155	Stop/Brake Modes
Stop/BRK Mode B	156	Stop/Brake Modes
SV Boost Filter	59	Torq Attributes
TB Man Ref Hi	97	Speed Reference
TB Man Ref Lo	98	Speed Reference
TB Man Ref Sel	96	Speed Reference
Testpoint X Data	235, 237	Diagnostics
Testpoint X Sel	234, 236	Diagnostics
Torq Ref A Div	430	Torq Attributes
Torque Current	4	Metering
Torque Perf Mode	53	Torq Attributes
Torque Ref X Sel	427, 431	Torq Attributes
Torque Ref X Hi	428, 432	Torq Attributes
Torque Ref X Lo	429, 433	Torq Attributes
Torque Setpoint	435	Torq Attributes
Torque Ref B Mult	434	Torq Attributes
Total Inertia	450	Spd Regulator
Trim Hi	119	Speed Trim
Trim In Select	117	Speed Trim
Trim Lo	120	Speed Trim
Trim Out Select	118	Speed Trim
Voltage Class	202	Drive Memory
Wake Level	180	Restart Modes
Wake Time	181	Restart Modes

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